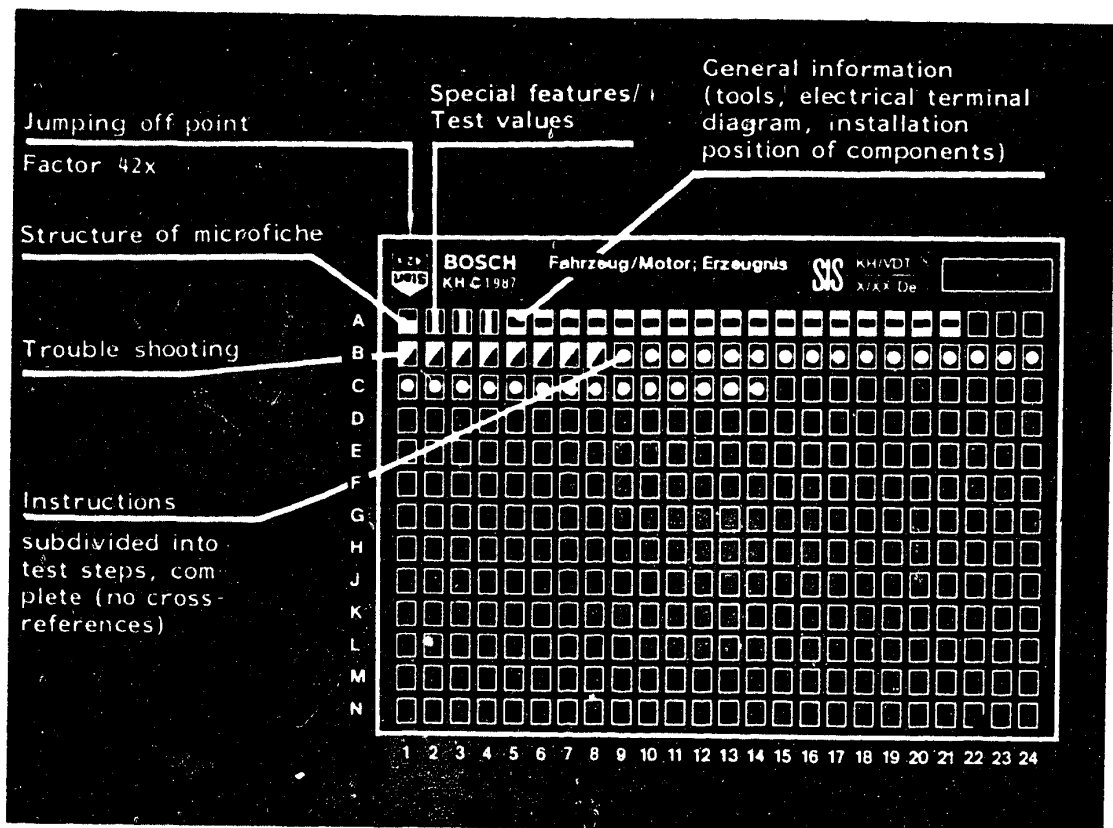


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



4. References to relevant test steps in test specifications; coordinate e.g. C6

**C6**

<b>A1</b>	Trouble-shooting program	↓
-----------	--------------------------	---

## 1. Special Features

190E 4 Cyl. engine 102.962 Model year 1987 Japan

230E 4 Cyl. engine 102.982 Model year 1985 Japan, AUS

equipped with:

EZ control unit 0 227 400 5..(with current limitation)  
or Siemens co. control unit (Daimler-Benz AG service  
part)

Comment: Bosch and Siemens control units are  
interchangeable (except in vehicle type 124 - Japan).  
Since 2.86 (gradually), vehicle type 124 - Japan has  
been delivered without trimming plug.

As of the date of this modification, the EI control  
unit installed has been supplied only by Siemens, the  
unit having the DB Part No. 003 545 70 32. If vehicles  
are retrofitted with the new EI control unit, the  
single trimming plug must be removed and the  
insulation of the coupling stripped, since otherwise  
all of the ignition-spark angles would be incorrectly  
retarded by 8° crankshaft.

Ignition coil 0 221 5..





## 2. Test specifications

Primary ignition coil	0.3 ... 0.6 $\Omega$
Secondary ignition coil	7.3 ... 13.2 $\Omega$

**B 11**

Coolant-temperature	+ 20°C	2.1 ... 2.9 k $\Omega$
sensor	+ 30°C	1.4 ... 2.0 k $\Omega$
	+ 80°C	280 ... 370 $\Omega$
	+ 90°C	210 ... 280 $\Omega$
	+ 100°C	160 ... 215 $\Omega$

**B 19**

### Spark advance without vacuum

Fuel	Countries	Engine speed min <sup>-1</sup> °kW BTDC
Super lead-free	Japan	3200 25 - 29°
Regular lead-free	Australia	3200 19 - 23°

**B 17****B 21**

In order to prevent incorrect measurement, always carry out testing per coordinates given.

**A3**

Test specifications  
Mercedes Benz



Single balancing plug  
for vehicle version:  
(not applicable to  
type 124 as of 2.86)

Japan 750  $\Omega$   
Australia 220  $\Omega$

**B23**

Voltage supply,  
EZ control unit and  
ignition coil when  
engine idling

12 ... 14 V  
max. 1V  
below  $U_B$

**C3**

Primary voltage when  
engine idling

280 ... 360 V

**C7**

Internal resistance,  
pulse generator

680 ... 1200  $\Omega$

**C9**

Insulation, pulse  
generator

$\infty \Omega$

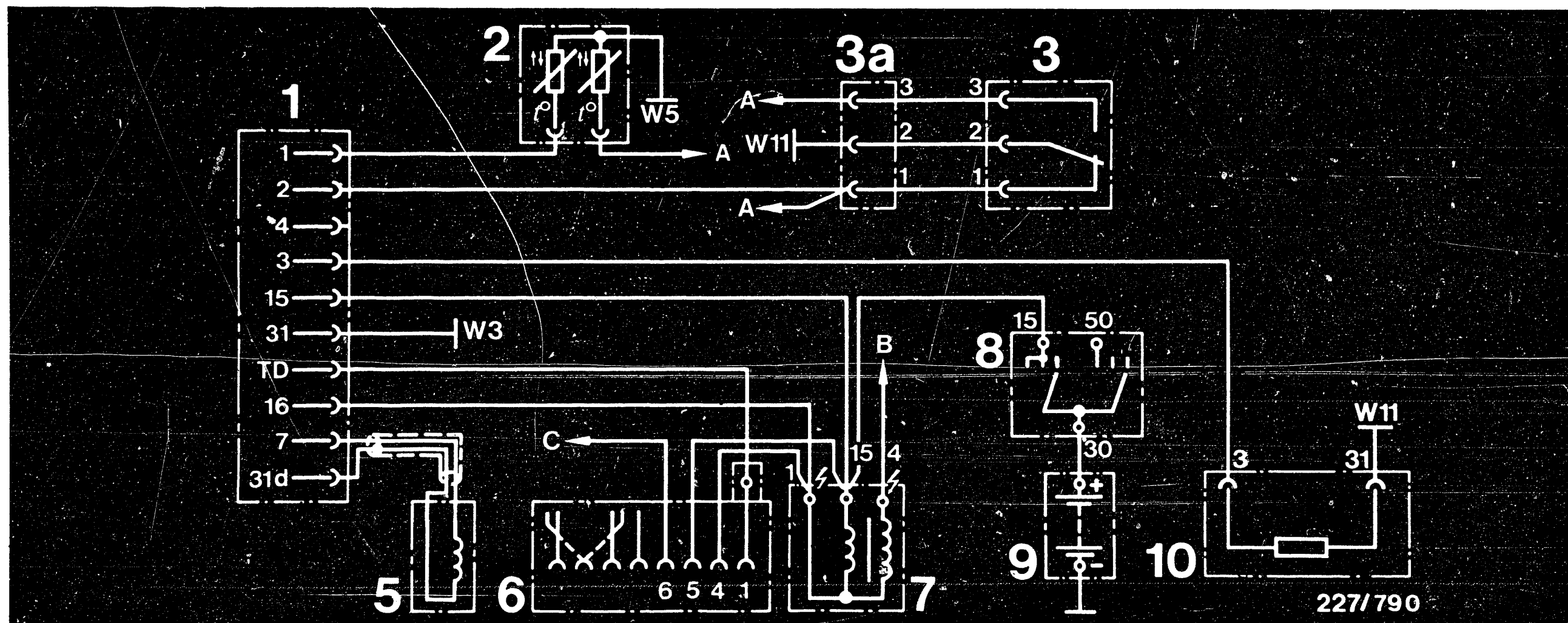
For setting values for idle speed, exhaust, etc., see  
SIS microcard for jetronic.

**A4**

Test specifications

Mercedes-Benz





Danger arrows:  
Warning: 400 V ... 25 kV

- 1 = Electronic-ignition control unit
- 2 = Coolant temperature sensor (double NTC)
- 3 = Throttle-valve switch
- 3a = Throttle-valve switch plug connector

- 5 = Pulse generator
- 6 = Diagnostic socket
- 7 = Ignition coil
- 8 = Ignition/starting switch
- 9 = Battery
- 10 = Trimming plug  
Japan = 750  $\Omega$   
OFF = 220  $\Omega$

- A = to KE-Jetronic control unit
- B = to high-voltage distributor
- C = Plug connector engine term. 30

- W 3 = Ground, wheel housing front left (ignition coil)
- W 5 = Ground, engine
- W11 = Ground, engine (electric lead screwed on)

### 3. Electrical terminal diagram

**A5**

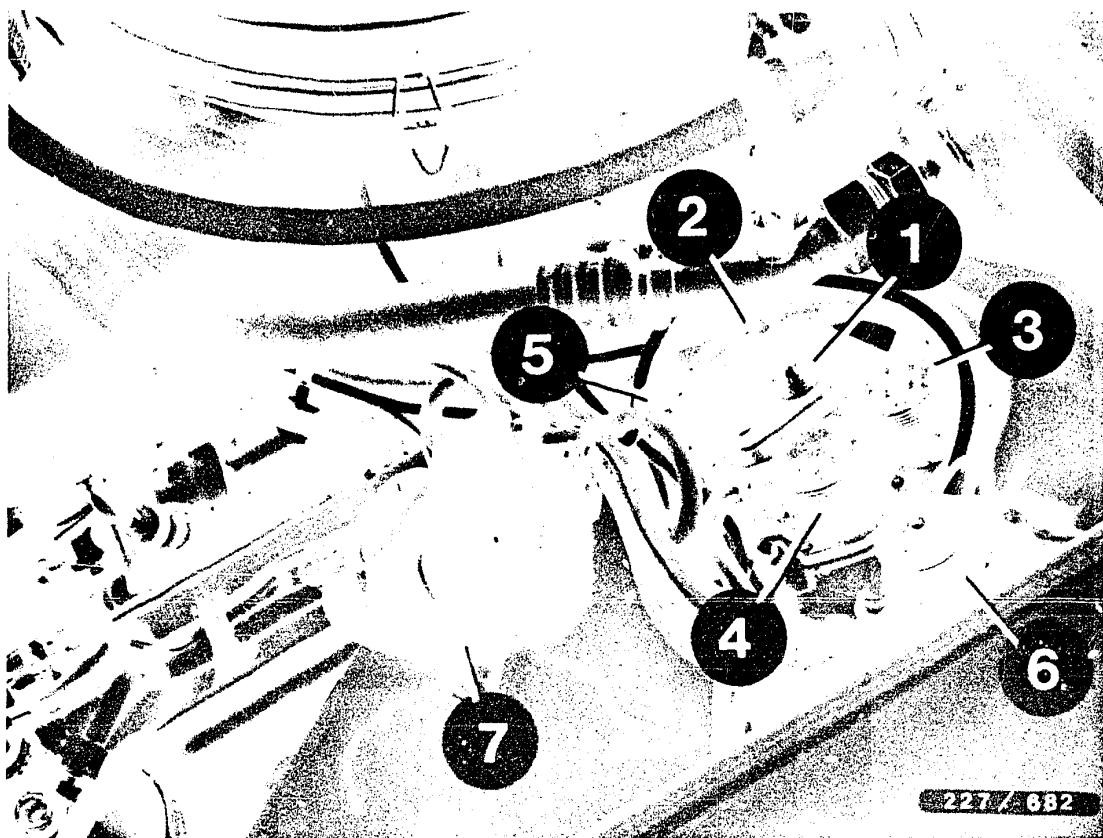
Electrical terminal diagram  
Mercedes-Benz



**A6**

Electrical terminal diagram  
Mercedes-Benz



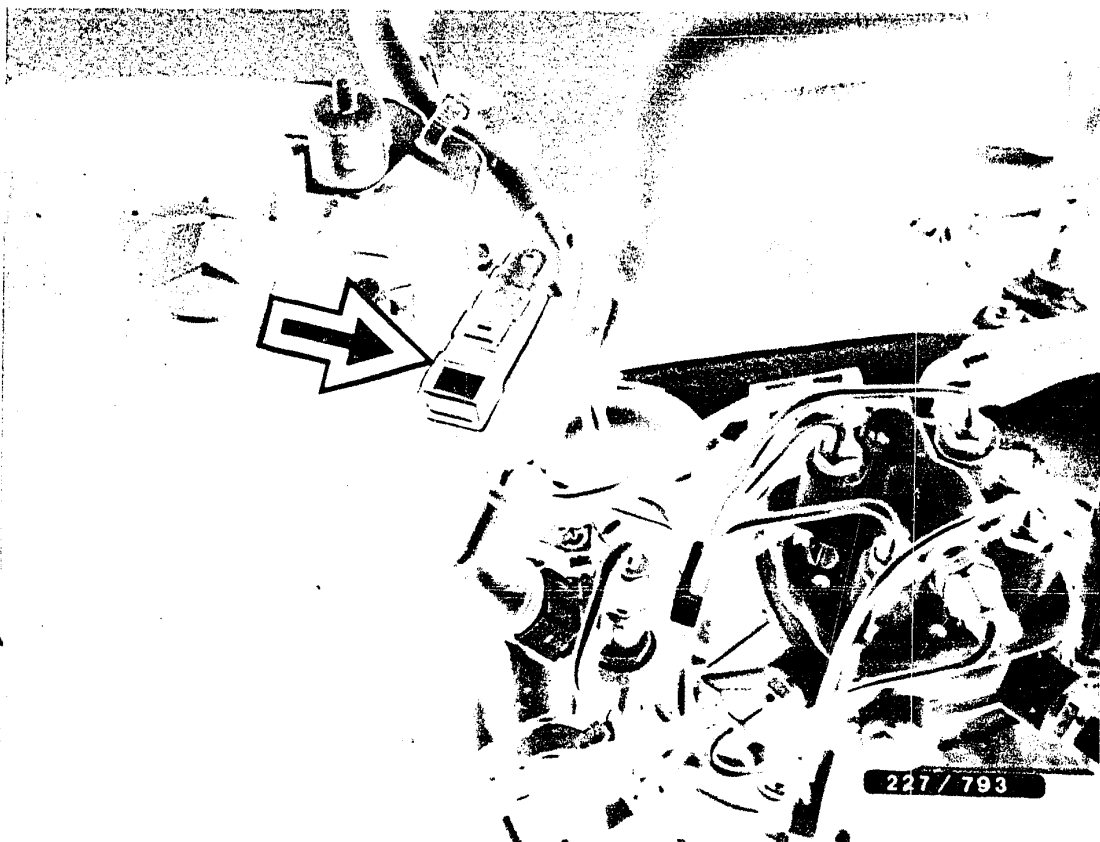


- 1 = Electronic ignition control unit  
e.g. vehicle model 124
- 2 = Vacuum hose
- 3 = Quadruple plug - power supply
- 4 = Quadruple plug - sensor
- 5 = Coaxial plug - pulse generator
- 6 = Diagnostic socket
- 7 = Plastic ignition coil with protective cover

#### 4. Installation position of components

Electronic-ignition control unit, diagnostic socket and ignition coil are situated on the wheel housing on the left-hand side as viewed in the forward direction of travel.



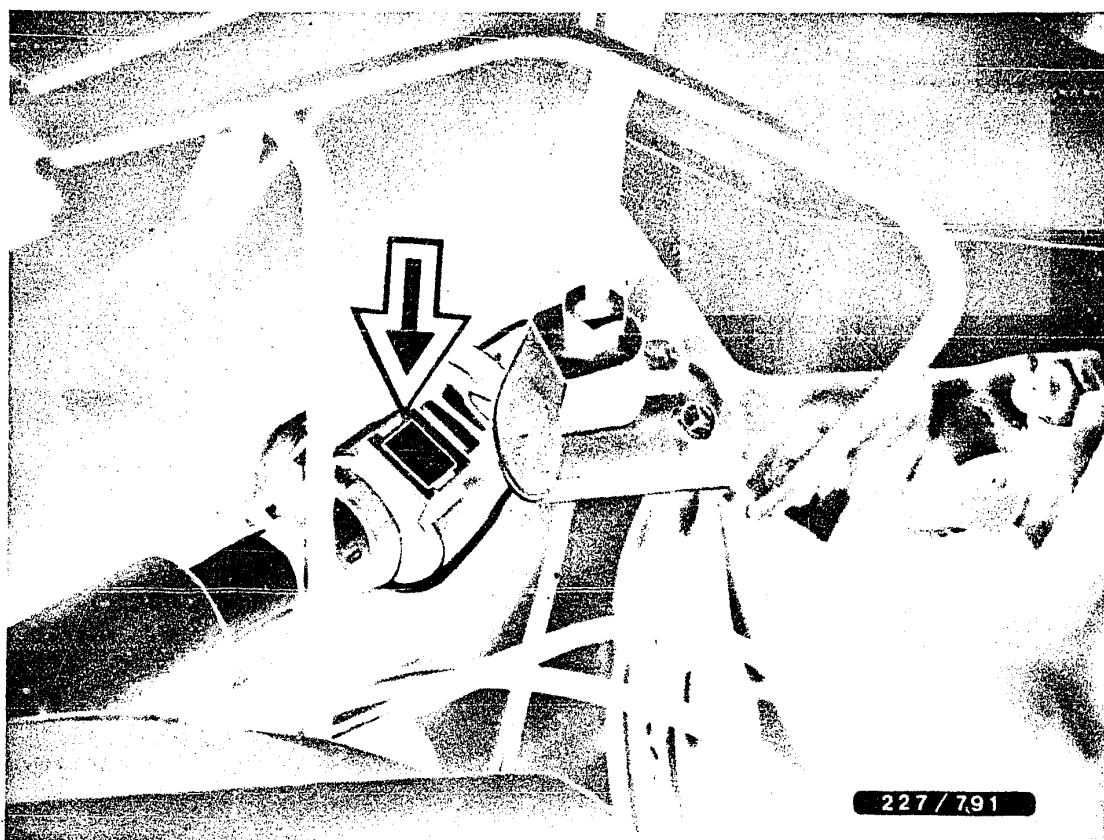


Arrow = Single balancing plug, ignition  
Vehicle model 201

**A8**

Installation position of components  
Mercedes-Benz





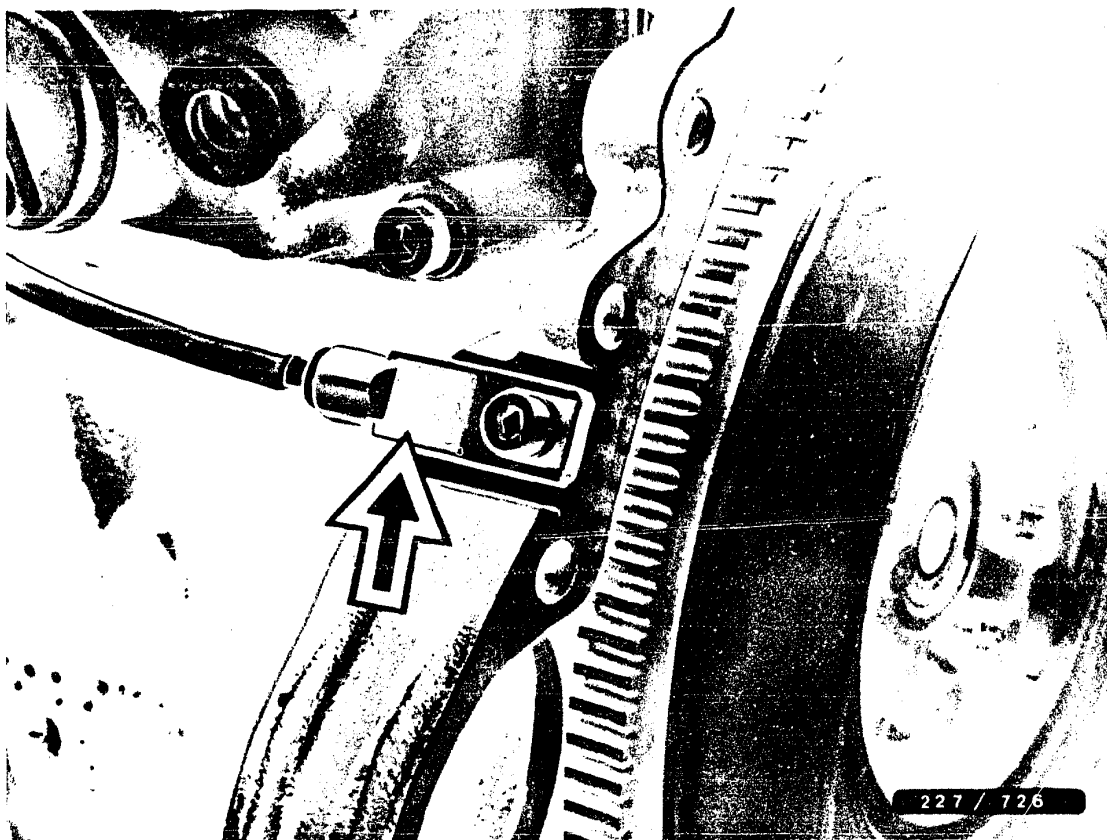
Arrow = Single balancing plug, ignition  
Vehicle model 124

Note: Since 2.86, vehicle type 124 – Japan has been delivered without single trimming plug.

**A9**

Installation position of components  
Mercedes-Benz





The pulse generator is located above the starting motor. See arrow in illustration.

**A10**

Installation position of components  
Mercedes-Benz





Arrow = Coolant temperature sensor (double NTC)

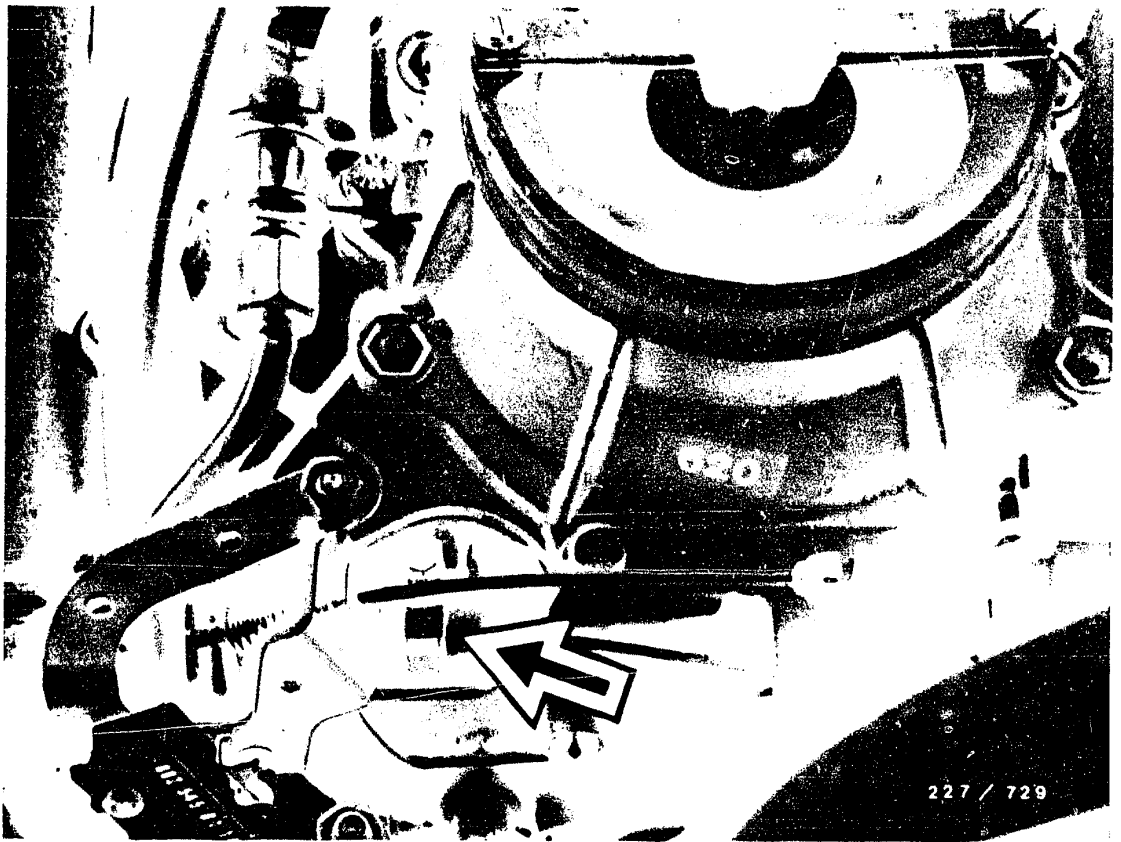
The coolant temperature sensor is located at the front on the cylinder head (thermostat housing).

**A11**

Installation position of components  
Mercedes-Benz







Arrow = Throttle-valve switch

The throttle-valve switch is located on the throttle-valve assembly.

**A12**

Installation position of components

Mercedes-Benz



## 5. Required test equipment and aids

Motortester e.g.	MOT 201	0 684 000 201
Pulse shaper (required for measuring the primary voltage with MOT 201, 202, 206 and 400)		1 684 463 154
Adapter lead for the diagnosis socket		1 684 463 094
Spark gap e. g. ignition coil and condenser tester	EFAW 106 A	0 681 100 001
or single spark gap	EF 1177/7	1 684 531 000
5 k $\Omega$ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontava Wh2	commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Thermal conduction paste		5 942 860 003
Test prod, black		1 684 485 034
Test prod, red (for correct connection of test equipment to plug connectors)		1 684 485 035



## 6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

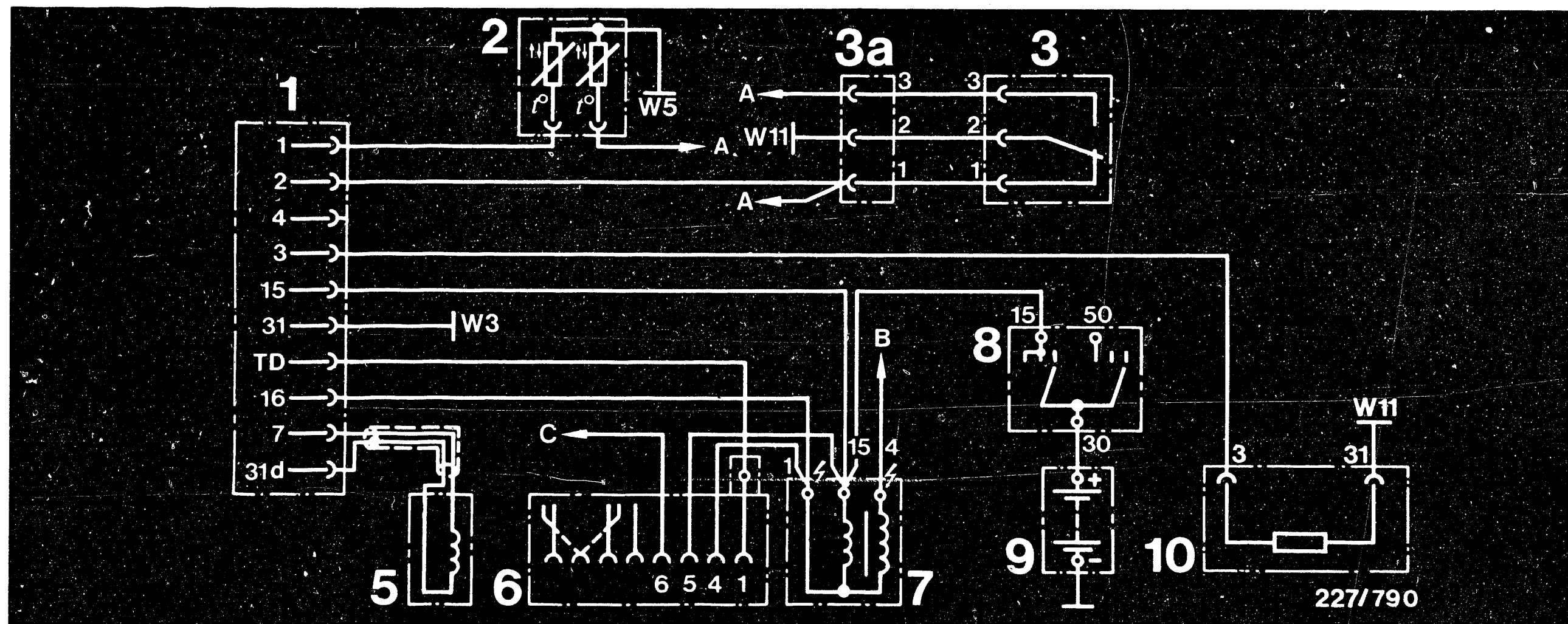
The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. KE-Jetronic), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.





Danger arrows:  
Warning: 400 V ... 25 kV

- 1 = Electronic-ignition control unit
- 2 = Coolant temperature sensor (double NTC)
- 3 = Throttle-valve switch
- 3a = Throttle-valve switch plug connector

- 5 = Pulse generator
- 6 = Diagnostic socket
- 7 = Ignition coil
- 8 = Ignition/starting switch
- 9 = Battery
- 10 = Trimming plug  
Japan = 750  $\Omega$   
OFF = 220  $\Omega$

- A = to KE-Jetronic control unit
- B = to high-voltage distributor
- C = Plug connector engine term. 30

- W 3 = Ground, wheel housing front left (ignition coil)
- W 5 = Ground, engine
- W11 = Ground, engine (electric lead screwed on)

#### Electrical terminal diagram

The hazard locations are identified with high voltage arrows using, as an example, the connection diagram for an electronic ignition system.

**A15**

Accident hazard  
Mercedes Benz



**A16**

Accident hazard  
Mercedes Benz



7. Incorrect indication of engine speed, dwell angle  
and ignition point

In the case of ignition systems with control unit 0 227 400 5.. or control units from Siemens (electronic ignition) with current limitation, there can be an incorrect reading for engine speed, dwell angle, and ignition timing on the test instruments.

For further details see coordinates N 7 - N 11.



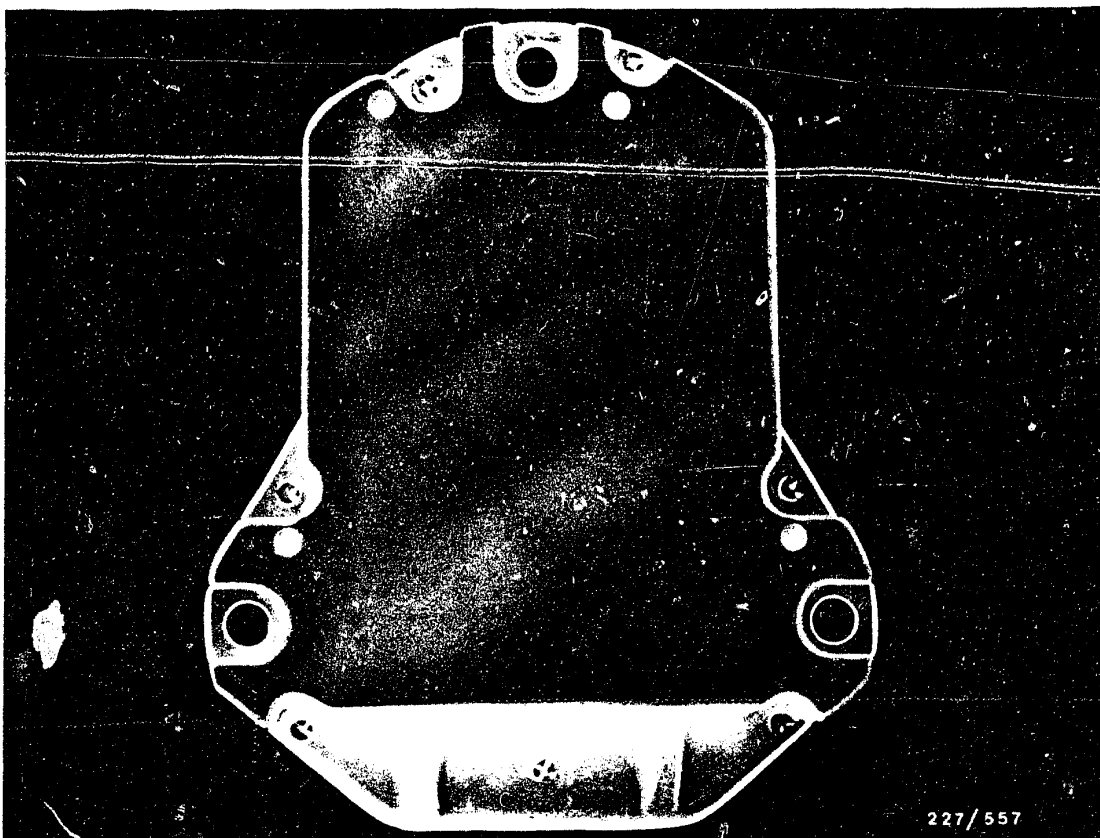
## 8. Important vehicle information

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- For a compression test, disconnect the coaxial plug (pulse generator) from the electronic ignition control unit.
- Never disconnect the battery while the engine is running.
- A starting assist with more 16 Volts or with a quick-charger is not permitted.
- The specified ignition coil (see Part.No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (the electronic ignition control unit is destroyed).
- The ignition lead from the ignition coil Term. 4 to the high voltage distributor Term. 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15.  
The electronic ignition control unit can be destroyed.



- If the poles are reversed on the ignition coil (Term. 1 and Term. 15) there are severe losses of ignition energy, causing missing. In addition, the electronic ignition control unit is overloaded. In order to preclude reversal of poles, the terminal studs have different diameters. (M5 and M6)
- In order to avoid destruction of the electronic ignition control unit, the secondary end of the ignition system must have interference suppression of min. 2 k $\Omega$ . The original distributor rotor must be installed with an interference suppression resistor of 1 k $\Omega$ .
- If the poles on the battery are incorrectly connected, the electronic ignition control unit and the ignition coil are destroyed.





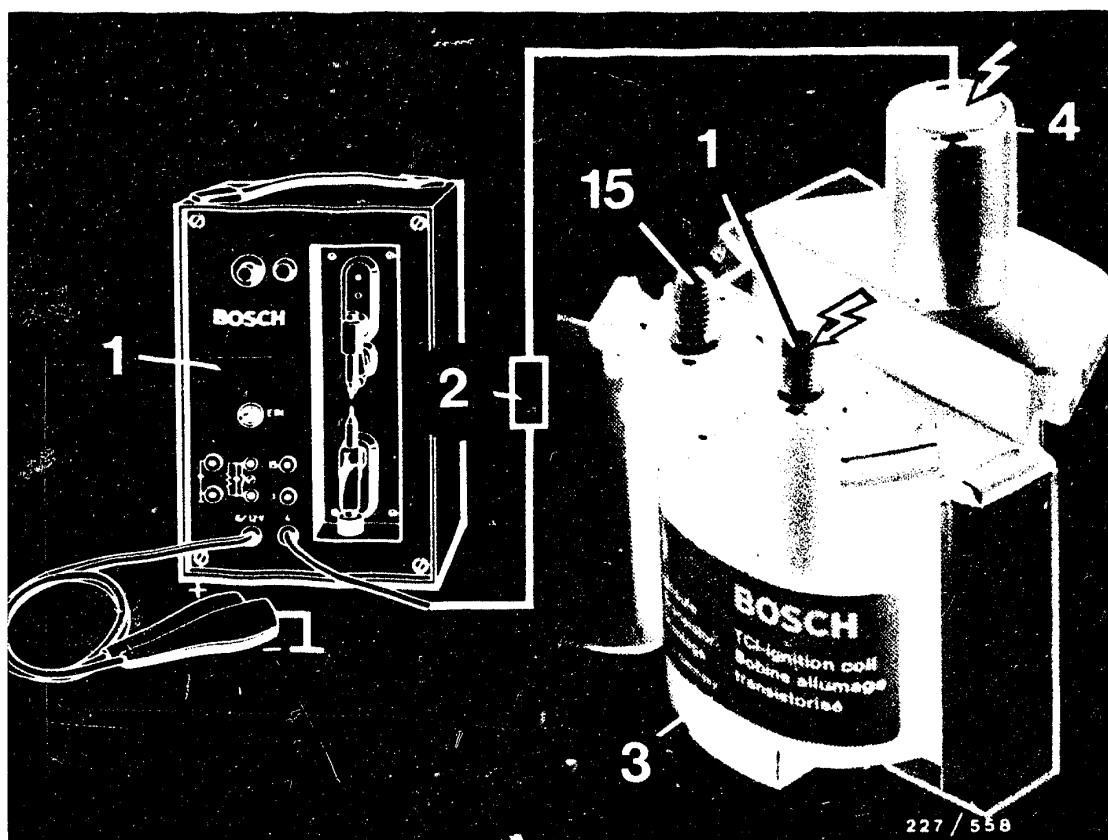
- Before putting on the electronic ignition control unit, the base plate (see the Figure, bright surface) must be coated with a heat conduction paste.

Apply thermal conduction paste only with a suitable object (screwdriver, etc.).

Do not apply thermal conduction paste to painted parts.







High voltage arrows:

Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 kΩ sleeve-type suppressor

3 = Ignition coil

- When using a spark gap - in order to prevent irreparable damage to the electronic-ignition control unit - an interference-suppression resistor of at least 2 kΩ must be connected between the spark gap and ignition coil terminal 4, e.g. sleeve-type suppressor (5 kΩ) 0 356 500 001.



## 9. Trouble-shooting

### 9.1 How to use the trouble-shooting chart

The trouble-shooting chart starting on Coordinate B 3 contains customer complaint (fault symptom), cause of trouble, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate B 9.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.  
If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

### 9.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate B 9 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 9.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

**B1**

Trouble-shooting  
Mercedes-Benz

**B2**

Trouble-shooting  
Mercedes-Benz



## 9.4 Trouble-shooting chart

### Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinates

●	●	●	●	●	●	●	●	●	Unclear	Perform detailed trouble-shooting	B 9
●	●	●	●	●	●	●	●		Spark plugs defective	Assessment by means of ignition oscilloscope or visual examination of spark plug when removed	----
●	●	●	●	●					Shunt on secondary side	Evaluation of the ignition coil, high voltage distributor, ignition harness, and spark plug by means of the ignition oscillogram or a visual inspection	----
●	●	●	●	●					Open circuit on secondary side	Assessment of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope, or continuity test with ohmmeter	----
●									Open circuit on primary side	--	C 11
●	●	●	●	●					Ignition coil defective	-	B 11
		●	●	●	●				Interference-suppression resistors defective	Assessment by means of ignition oscilloscope or resistance measurement	----

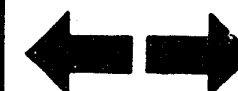
**B3**

Trouble-shooting chart  
Mercedes Benz



**B4**

Trouble-shooting chart  
Mercedes Benz



# Trouble-shooting chart (continued)

## Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinates

●							●	Incorrect firing sequence	1-3-4-2	---
●		●		●			●	Contact resistance/electronic-ignition control unit defective	---	B 13
●								Contact resistance, ignition coil, or EZ control unit defective	---	B 15
			●		●	●	●	Pressure sensor not O.K.	---	B 17
			●		●			Coolant temperatur sensor not O.K.	---	B 19
			●		●	●		Incorrect timing angle	To prevent incorrect measurements, test <u>must</u> be performed as described on Coordinates given on right.	B 17...B21
			●		●	●	●	Throttle-valve switch (idle contact) not O.K.		C 1

**B5**

Trouble-shooting chart

Mercedes-Benz



**B6**

Trouble-shooting chart

Mercedes-Benz



# Trouble-shooting chart (continued)

## Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start
2. Rough idling
3. Poor throttle response (flat spot during acceleration)
4. Insufficient engine power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine overheats

									<u>Cause of trouble</u>	<u>Test instructions</u>	<u>Coordinates</u>
				●					Electronic ignition control unit not O.K.	---	C 7
●									Pulse generator not O.K.	---	C 9
●									Voltage supply to electronic ignition control unit not O.K.	---	C 11

**B7**

Trouble-shooting chart

Mercedes-Benz



**B8**

Trouble-shooting chart

Mercedes-Benz



## 9.5 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Remove the protective cap from the ignition coil.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

Primary signal present or ignition sparks across spark gap?

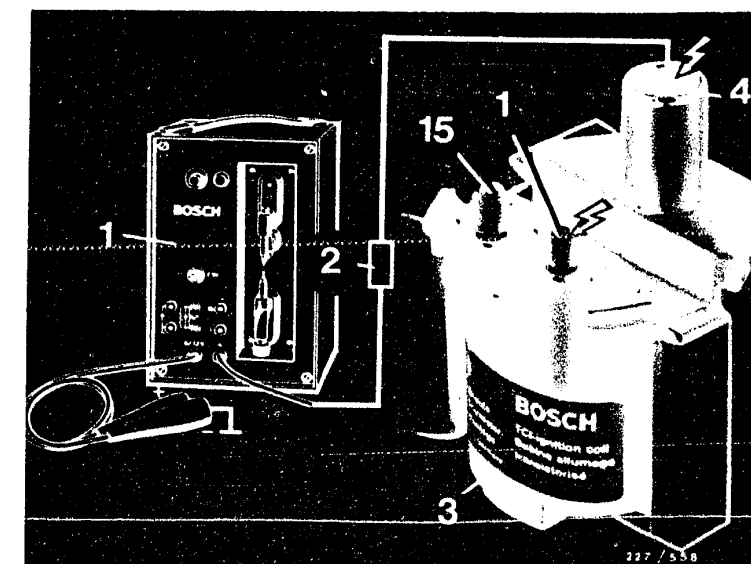
yes

Continued on B11/B12

no

If no primary signal or no ignition spark, continue testing at C9.

Tests from B11 onwards not necessary.



High voltage arrows:

Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 k $\Omega$  sleeve-type suppressor

3 = ignition coil

**B9**

Trouble-shooting program

Mercedes Benz

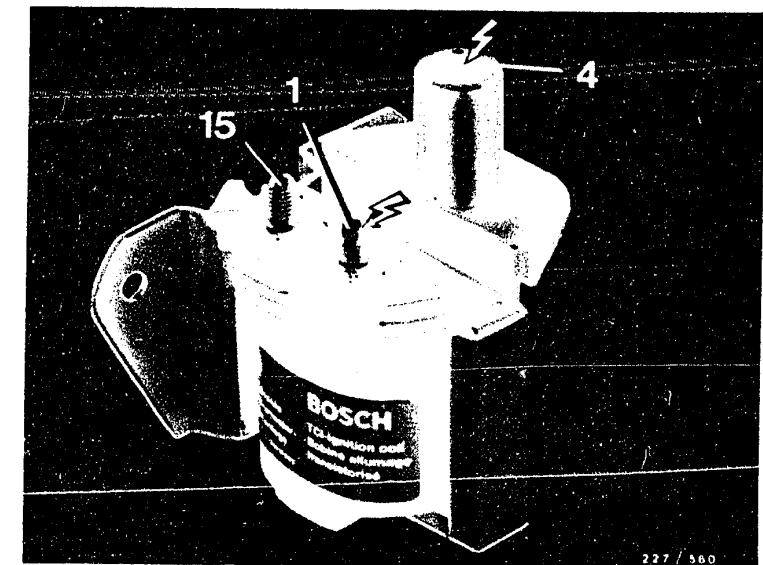
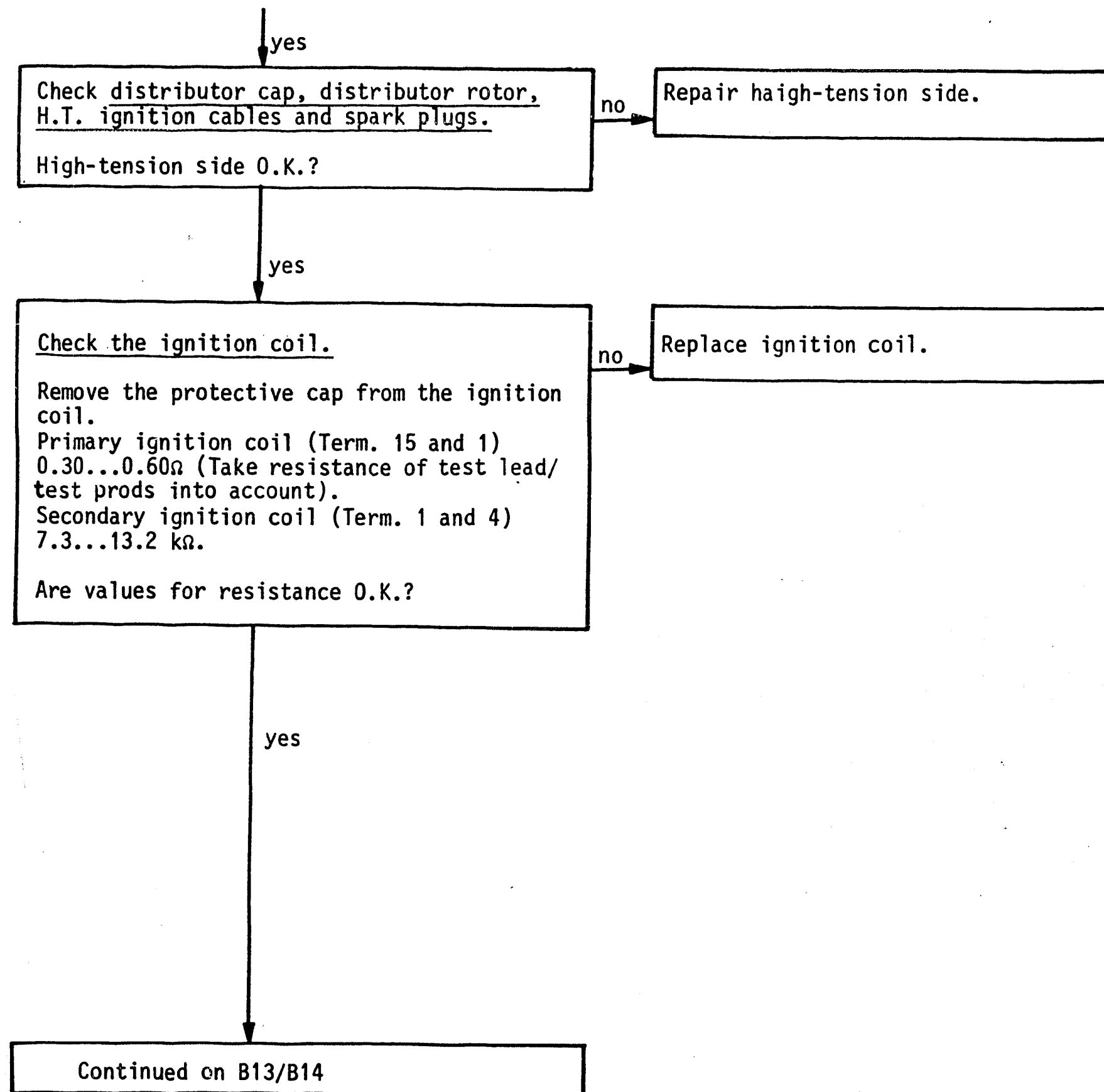


**B10**

Trouble-shooting program

Mercedes Benz





High voltage arrows:  
Warning, 400 V ... 25 kV!

**B 11**

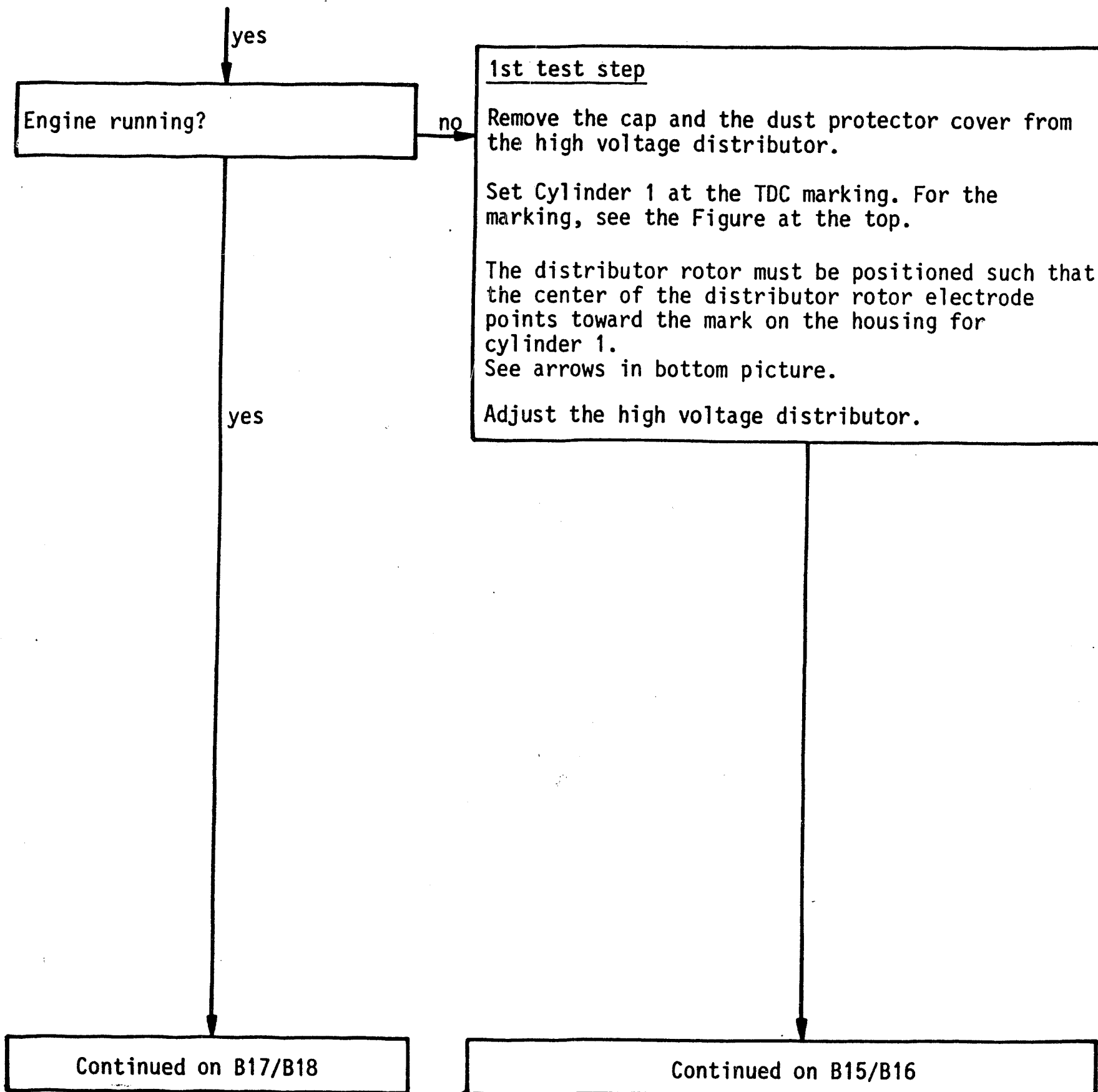
Trouble-shooting program  
Mercedes Benz



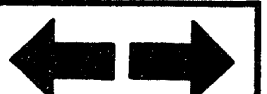
**B 12**

Trouble-shooting program  
Mercedes Benz





Arrow=TDC marking





continued

2nd test step

Disconnect the negative and positive leads from the battery.

Disconnect the electronic ignition control unit plug. Switch the ignition on.

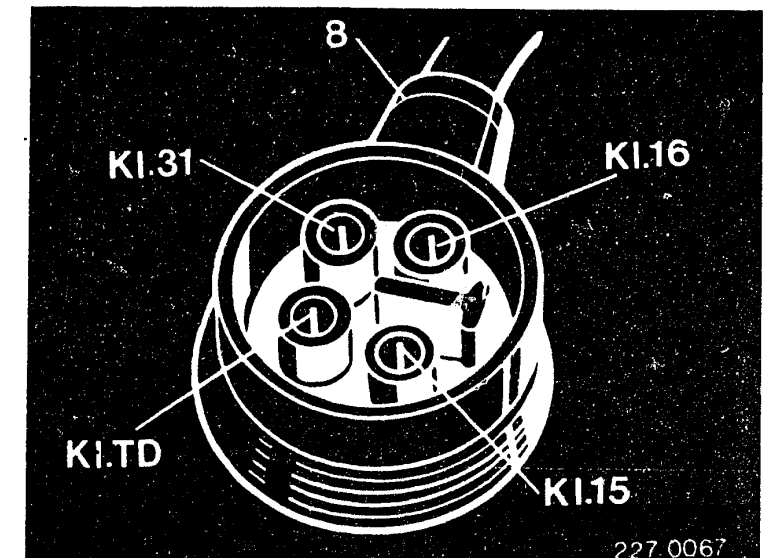
1. Check the leads from the positive battery terminal to the electronic ignition control unit plug Term. 15 and the leads from the negative battery terminal to the electronic ignition control unit plug Term. 31 for contact resistances. Max. total contact resistance 0.3Ω. (Take resistance of test lead into consideration). Eliminate contact resistances.

2. Check the leads from the positive battery terminal to the ignition coil Term. 15 and the lead from the ignition coil Term. 1 to the electronic ignition control unit plug Term. 16 for contact resistance. Max. total contact resistance 0.3 Ω. (Take the resistance of the test lead into consideration). Eliminate any contact resistance.

3. If test steps 1 and 2 were OK, try installing prescribed ignition coil. If engine still does not run, re-install "old" ignition coil and replace EZ control unit.

yes

Continued on B17/B18



8=Electronic ignition control unit plug

**B 15**

Trouble-shooting program  
Mercedes Benz



**B 16**

Trouble-shooting program  
Mercedes Benz



yes

### Check the pressure sensor

Connect the motortester to the diagnosis socket using an adapter cable. Disconnect the vacuum hose from the electronic ignition control unit. See the Figure at the top.

Take the plug connection from the throttle valve switch apart. See the Figure at the bottom. Run the engine at idle.

Take reading for timing angle.

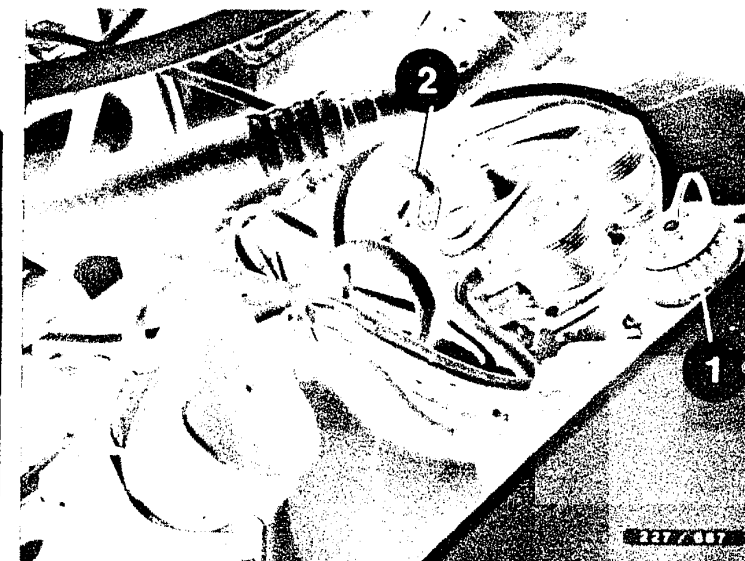
Put the vacuum hose back on the electronic ignition control unit. When this is done, the timing angle must change noticeably (in the direction "advance").

Did the timing angle change?

no

1. Check the vacuum hose from the electronic ignition control unit to the intake manifold plug connection for leaks. Eliminate any leaks.

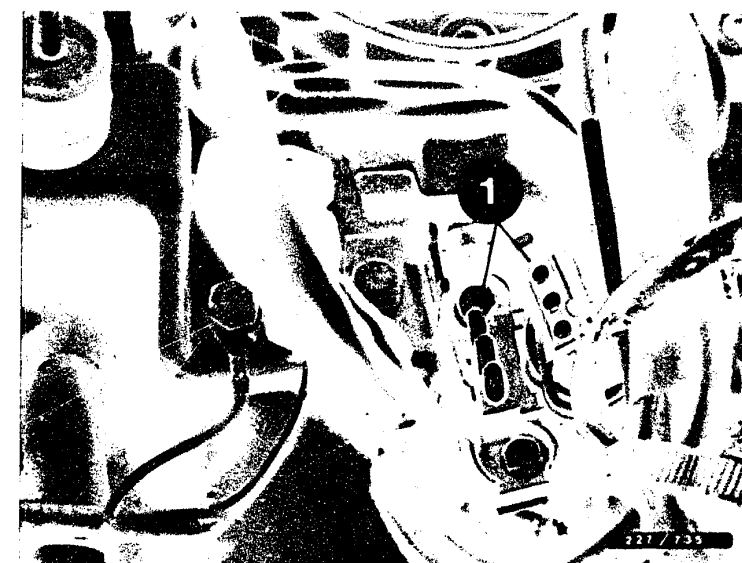
2. If there was no leak, take out and replace the electronic ignition control unit.



1=Diagnosis socket  
2=Vacuum hose  
e.g. vehicle model 124

yes

1=Plug connection from the throttle valve switch



Continued on B19/B20

**B17**

Trouble-shooting program  
Mercedes Benz



**B18**

Trouble-shooting program  
Mercedes Benz



yes

Check the coolant temperature sensor.

Warm the engine up to normal operating temperature.  
Connect the motortester to the diagnosis socket using an adapter lead.  
Disconnect vacuum hose from electronic-ignition control unit (not shown).  
Take apart throttle-valve switch plug connector (top picture Item 1).  
Run the engine at  $3200 \text{ min}^{-1}$ . Take reading for timing angle.  
Disconnect the coolant temperature sensor plug (color of cable green/black).  
See arrow in center picture).  
When this is done, the timing angle must change.

Did the timing angle change?

no

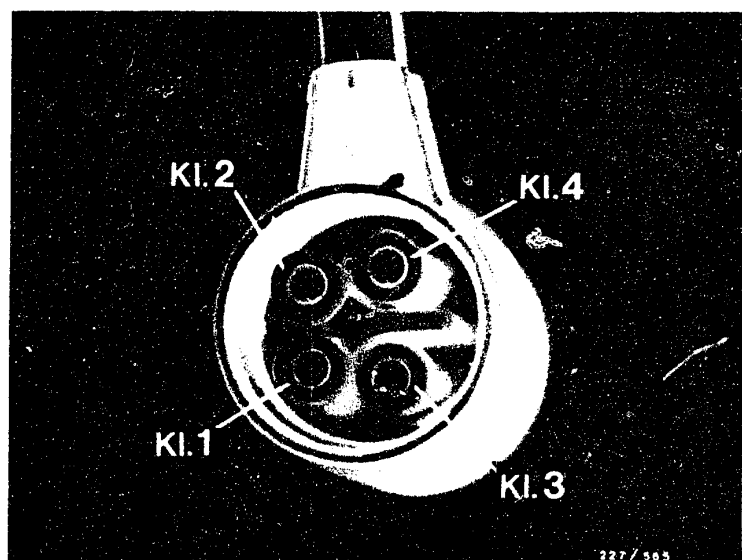
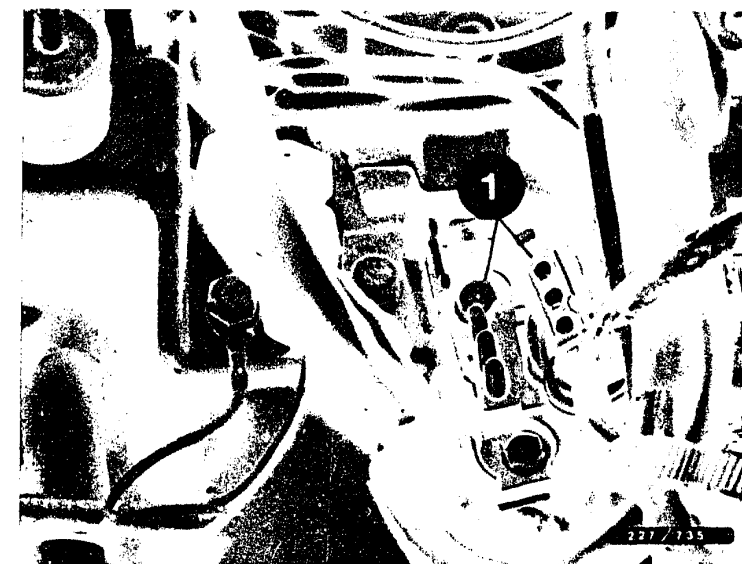
Switch the ignition off.  
Disconnect the electronic ignition control plug and connect an ohmmeter to Term. 1 (see figure at bottom) and vehicle ground.  
For resistances, see the table.

Coolant temperature		Resistance
+ 20°C	=	2.1...2.9 kΩ
+ 30°C	=	1.4...2.0 kΩ
+ 80°C	=	280...370 Ω
+ 90°C	=	210...280 Ω
+100°C	=	160...215 Ω

If the ohmmeter reads  $\infty\Omega$ , then check the lead from the coolant temperature sensor plug (color of cable green/black) to the electronic ignition control unit plug Term. 1 for continuity. Eliminate any break. If the values for resistance deviate, take out and replace the coolant temperature sensor.

yes

Continued on B21/B22



yes

Check spark advance.  
Engine at operating temperature.  
Motortester with adaptor lead connected to diagnosis socket.  
Vacuum hose from EZ control unit pulled off.  
See upper illustration.  
Plug connection from throttle-valve switch is disconnected. See lower illustration.

Nominal spark-advance value at:

Fuel	Countries	Eng. speed min <sup>-1</sup> / °KW BTDC
Super lead-free	Japan	3200 25 - 29°
Regular lead-free	Australia	3200 19 - 23°

Spark advance OK per table?

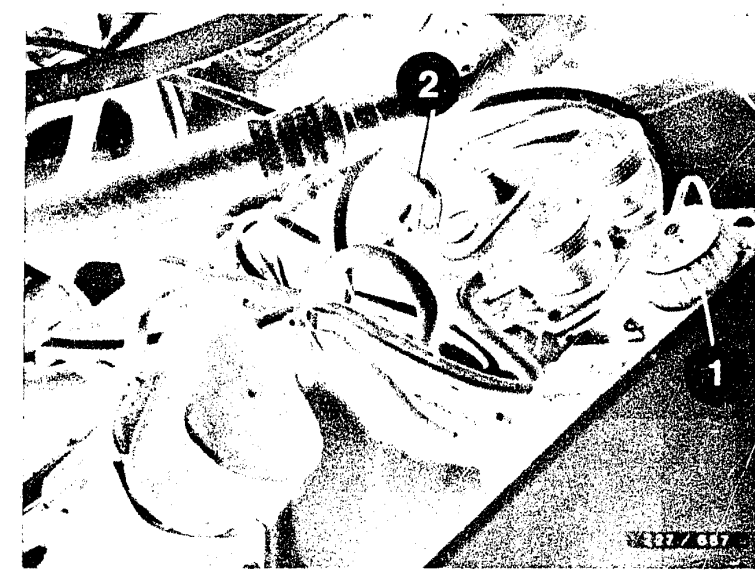
yes

no

Switch off ignition

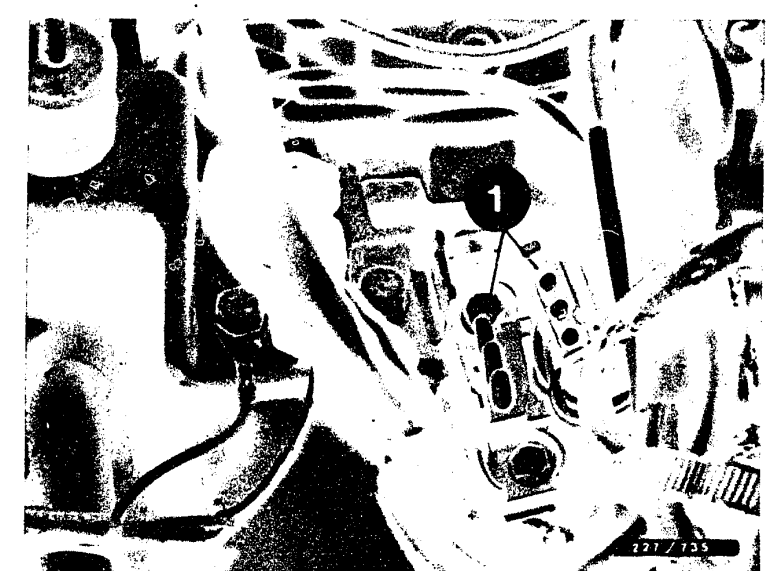
Continued on C1/C2

Continued on B23/B24



1 = Diagnosis socket  
2 = Vacuum hose  
e.g. vehicle model 124

1 = Plug connection from throttle-valve switch



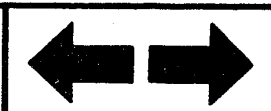
**B21**

Trouble-shooting program  
Mercedes-Benz



**B22**

Trouble-shooting program  
Mercedes-Benz



Continued

Unplug EZ control unit plug and connect ohmmeter to term. 3 and vehicle ground. See upper illustration.  
Resistance with:  
Japan vehicle = 750  $\Omega$  (not applicable to  
Australia vehicle = 220  $\Omega$  type 124 as of 2.86)

If resistance is OK replace EZ control unit.

If resistance is approx. 0  $\Omega$  or  $\infty\Omega$ , check single balancing plug, including electric leads, for ground connection / open circuit. Eliminate defects.

If resistance is outside tolerance replace single balancing plug.

yes

Continued on C1/C2

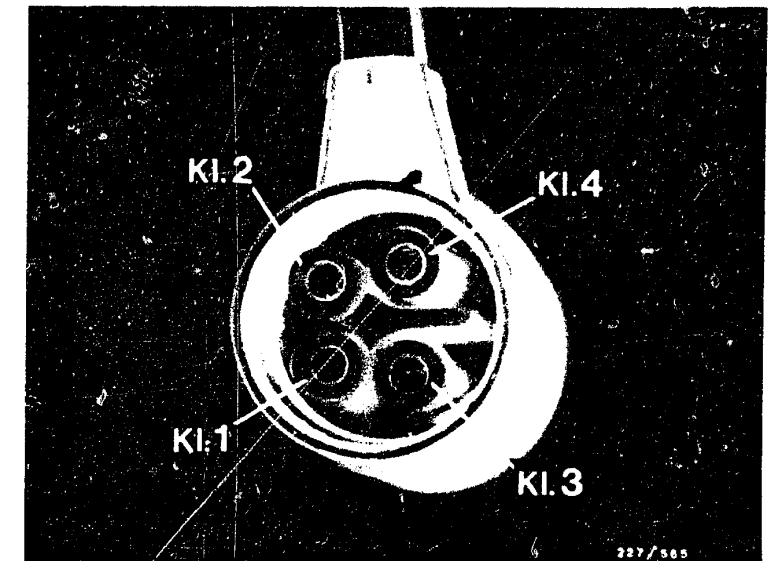
**B23**

Trouble-shooting program  
Mercedes-Benz



**B24**

Trouble-shooting program  
Mercedes-Benz



EZ control unit plug

Single balancing plug  
e.g. vehicle model 124



↓ yes

Check throttle-valve switch idle contact. Switch off ignition. Disconnect KE-Jetronic control-unit plug (not shown). Disconnect electronic-ignition control-unit plug and connect ohmmeter to term. 2 and vehicle ground. See top picture. Throttle-valve switch plug connector connected. Throttle valve is in idle position. Ohmmeter must indicate approx.  $0\ \Omega$  (continuity). Open throttle valve. Ohmmeter must indicate  $\infty\ \Omega$ .

Resistance O.K.?

no →

1. Disconnect the plug connection from the throttle valve switch. See the Figure at the center. Connect an ohmmeter one after the other to:

Throttle valve switch plug connection (Center picture)

Electronic ignition control unit plug

Term. 1 and Term. 2

Term. 2 and vehicle ground

The ohmmeter must read approx.  $0\ \Omega$  (continuity). Eliminate any break.

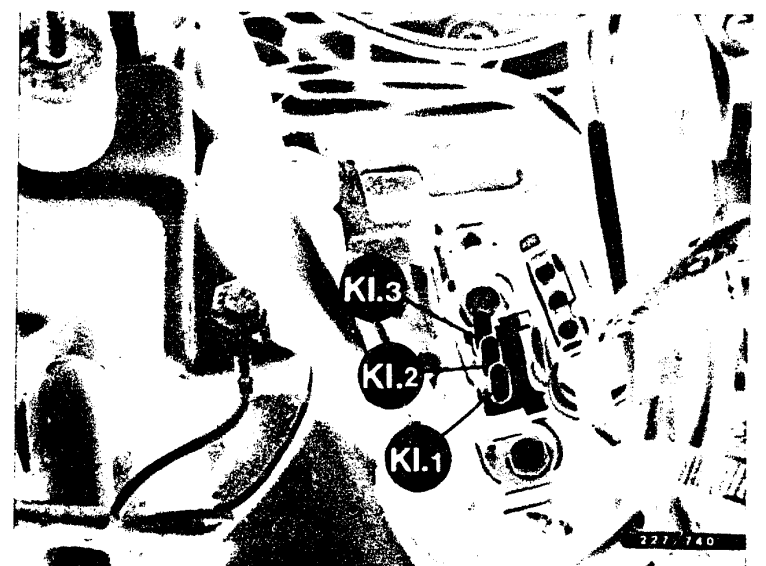
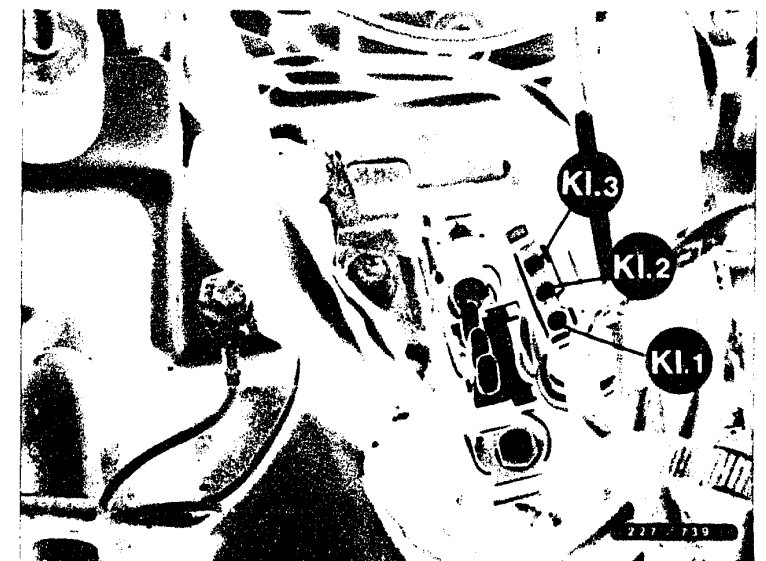
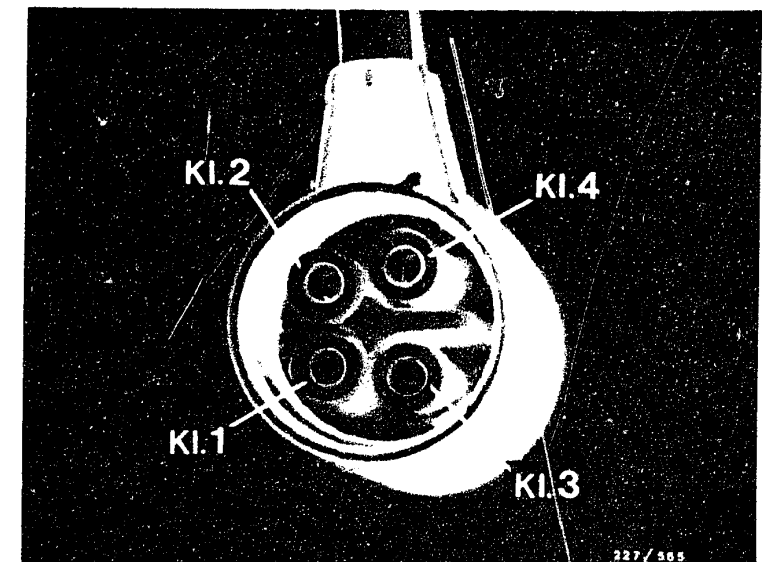
2. Connect the ohmmeter to the throttle valve switch plug connection Term. 1 and Term. 2. See the Figure at the bottom. The throttle valve is closed. Resistance approx.  $0\ \Omega$ .

Open the throttle valve. The ohmmeter must read  $\infty\ \Omega$ .

If resistance not O.K., replace throttle-valve switch.

yes ↓

Continued on C3/C4



C1

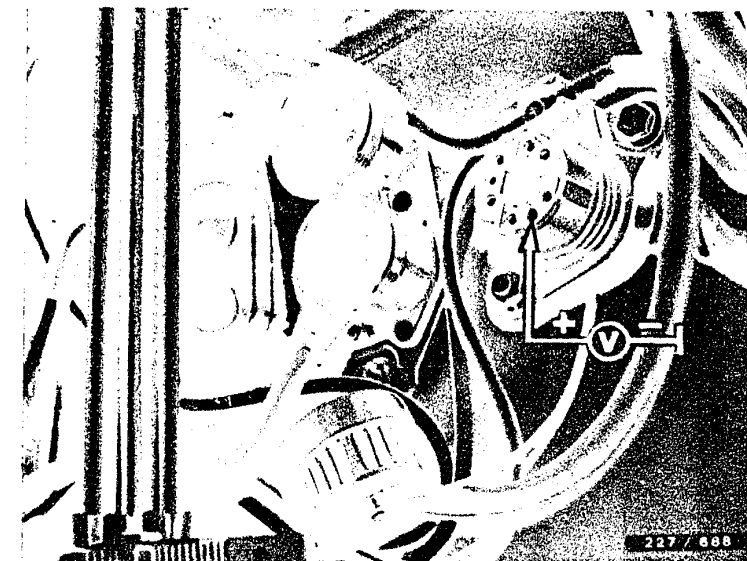
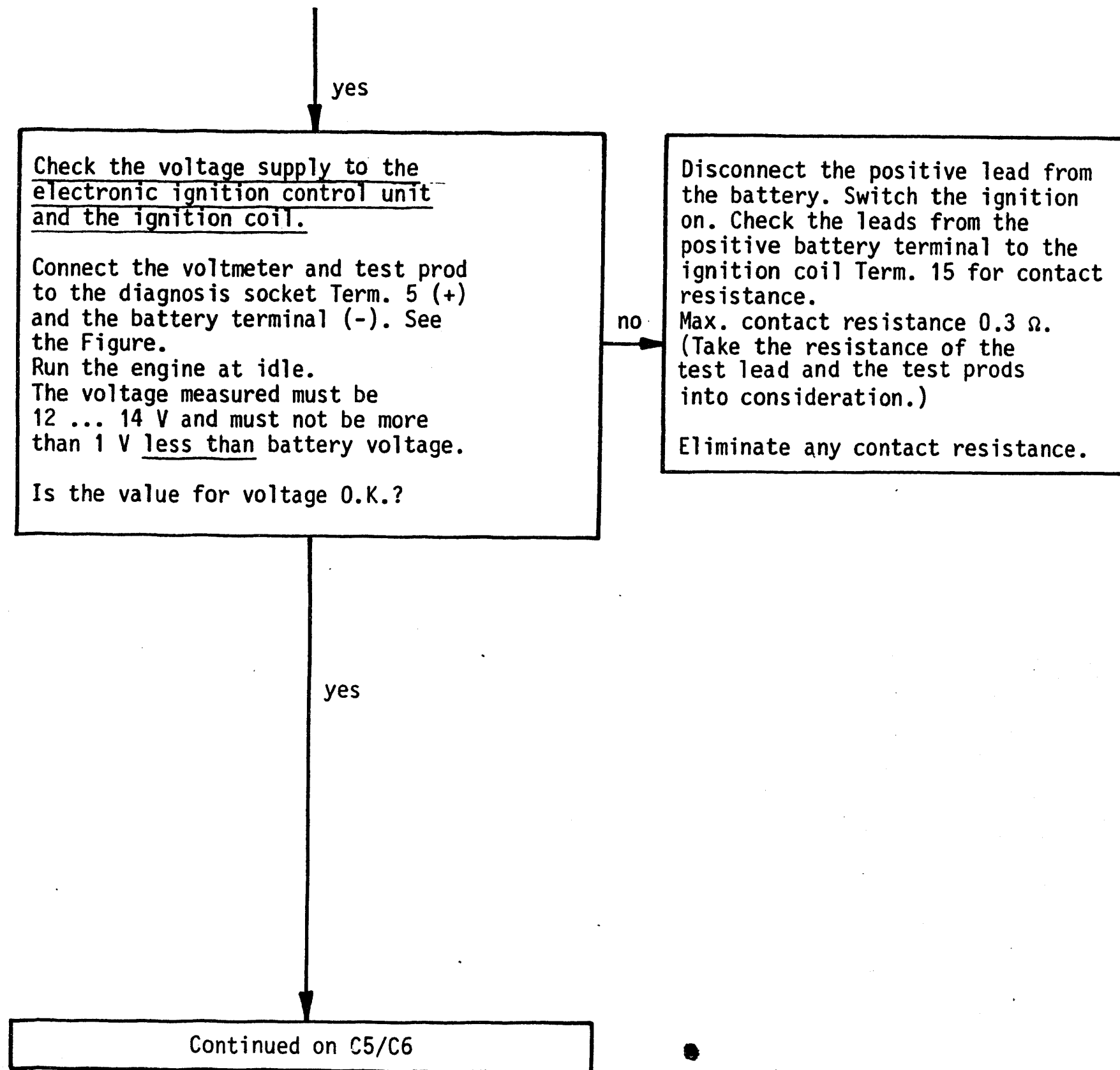
Trouble-shooting program  
Mercedes-Benz



C2

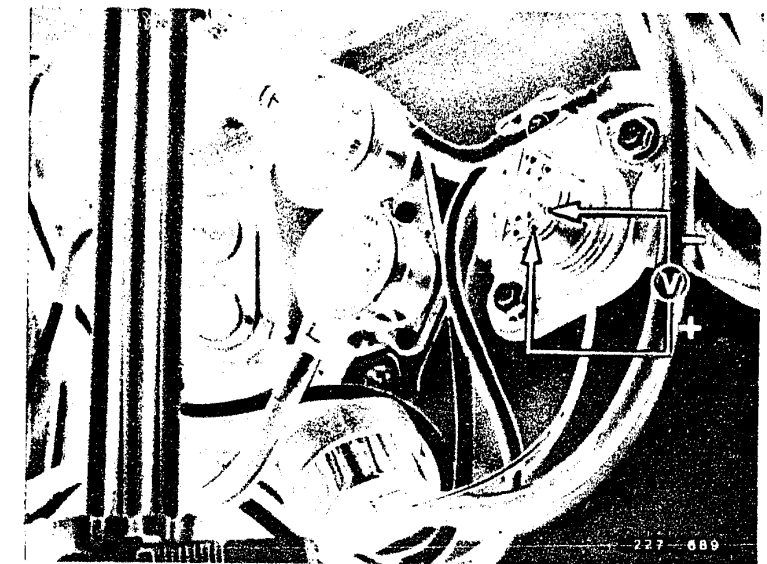
Trouble-shooting program  
Mercedes-Benz



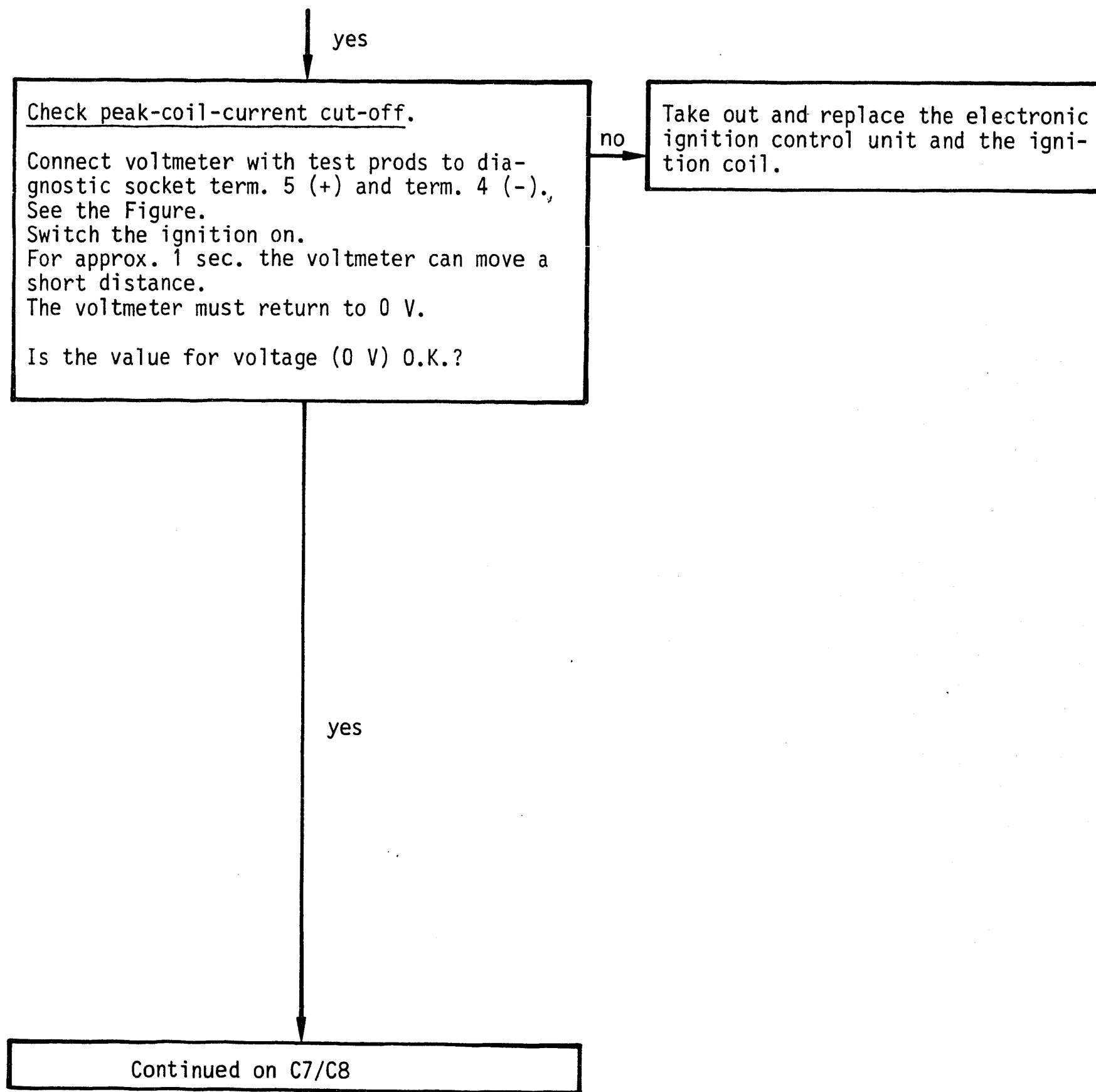


Diagnosis socket  
e.g. vehicle model 124





Diagnosis socket  
e.g. vehicle model 124



**C5**

Trouble-shooting program  
Mercedes-Benz



**C6**

Trouble-shooting program  
Mercedes-Benz





yes

Test primary voltage.  
(If MOT series available).  
Connect oscilloscope (e.g. MOT 201) together  
with pulse shaper 1 684 463 154 to ignition  
coil according to operatin instructions.  
Note: Incorrect reading without pulse shaper.  
Allow engine to idle.  
Measured primary voltage must be 280-360 V.  
See graph.

Voltage correct?

no

Take out and replace the electronic  
ignition control unit.

yes

If all test steps were OK and customer  
complaint has not yet been eliminated, try  
installing prescribed ignition coil.  
If customer complaint still not eliminated,  
re-install "old" ignition coil.

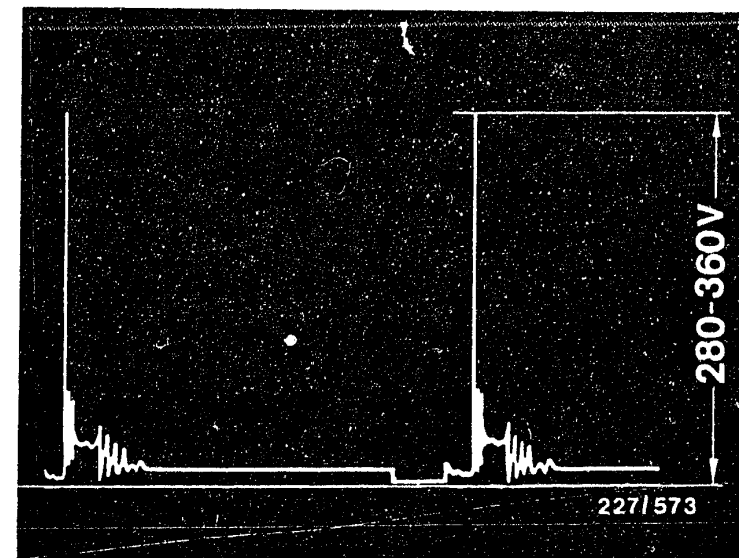
Ignition system OK.

Testing completed

Testing as of C9 no longer necessary.

Note:

There may still be defects in the fuel system,  
or the engine can be mechanically out of  
order.



**C7**

Trouble-shooting program

Mercedes-Benz



**C8**

Trouble-shooting program

Mercedes-Benz



No primary voltage or no ignition spark.

(Continued from B9/B10)

yes

Check insulation of pulse generator.

Disconnect the electronic ignition control unit plug and connect an ohmmeter to Term. 7 and the battery terminal (-). See the Figure at the top. The ohmmeter must read  $\infty \Omega$ . Is the value for resistance O.K.?

no

If the value for resistance is approx.  $0 \Omega$ , take out and replace the pulse generator. See the Figure at the bottom.

yes

Check the internal resistance of the pulse generator.

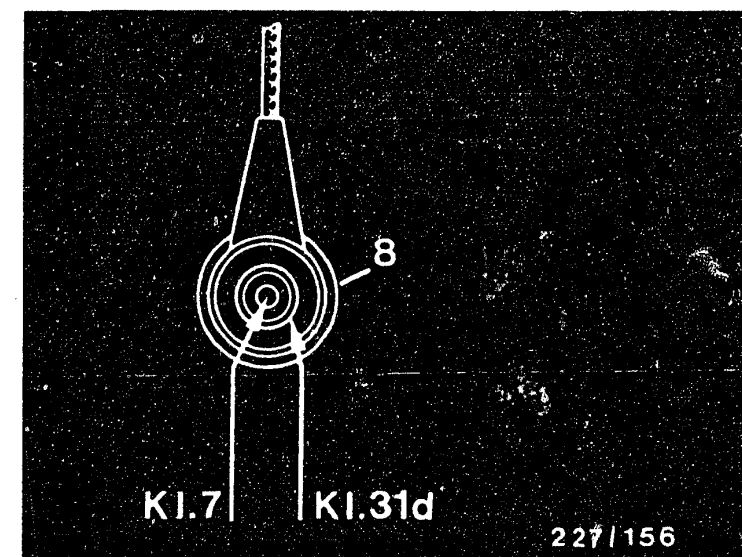
Disconnect the electronic ignition control unit plug and connect an ohmmeter to Term. 7 and Term. 31d. See the Figure at the top. The ohmmeter must read  $680 \dots 1200 \Omega$ . Is the value for resistance O.K.?

no

Take out and replace the pulse generator. See the Figure at the bottom.

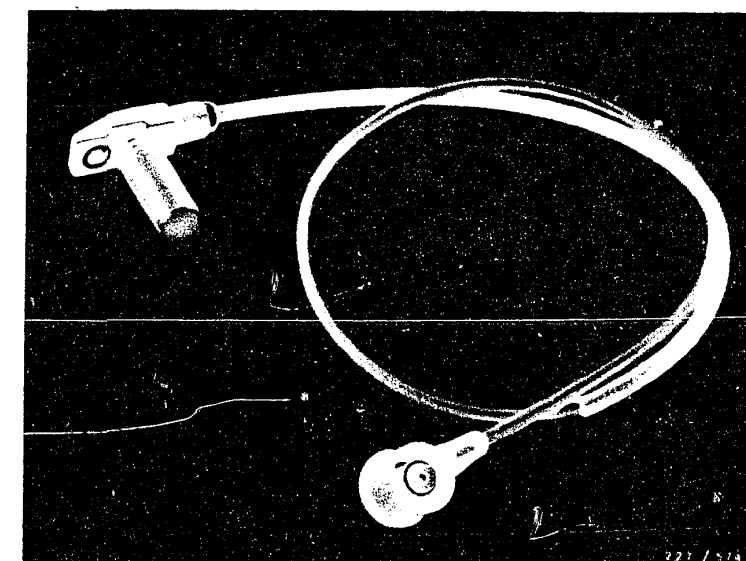
yes

Continued on C11/C12



8=Electronic ignition control unit plug - pulse generator

Pulse generator



**C9**

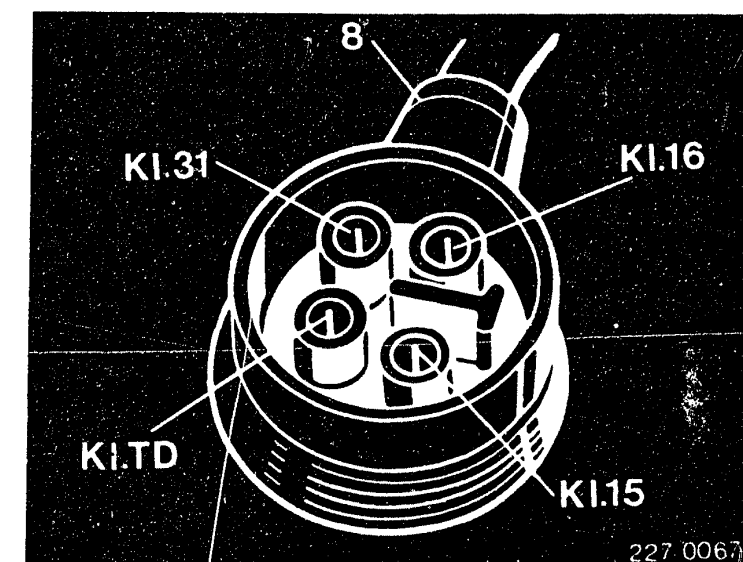
Trouble-shooting program  
Mercedes-Benz



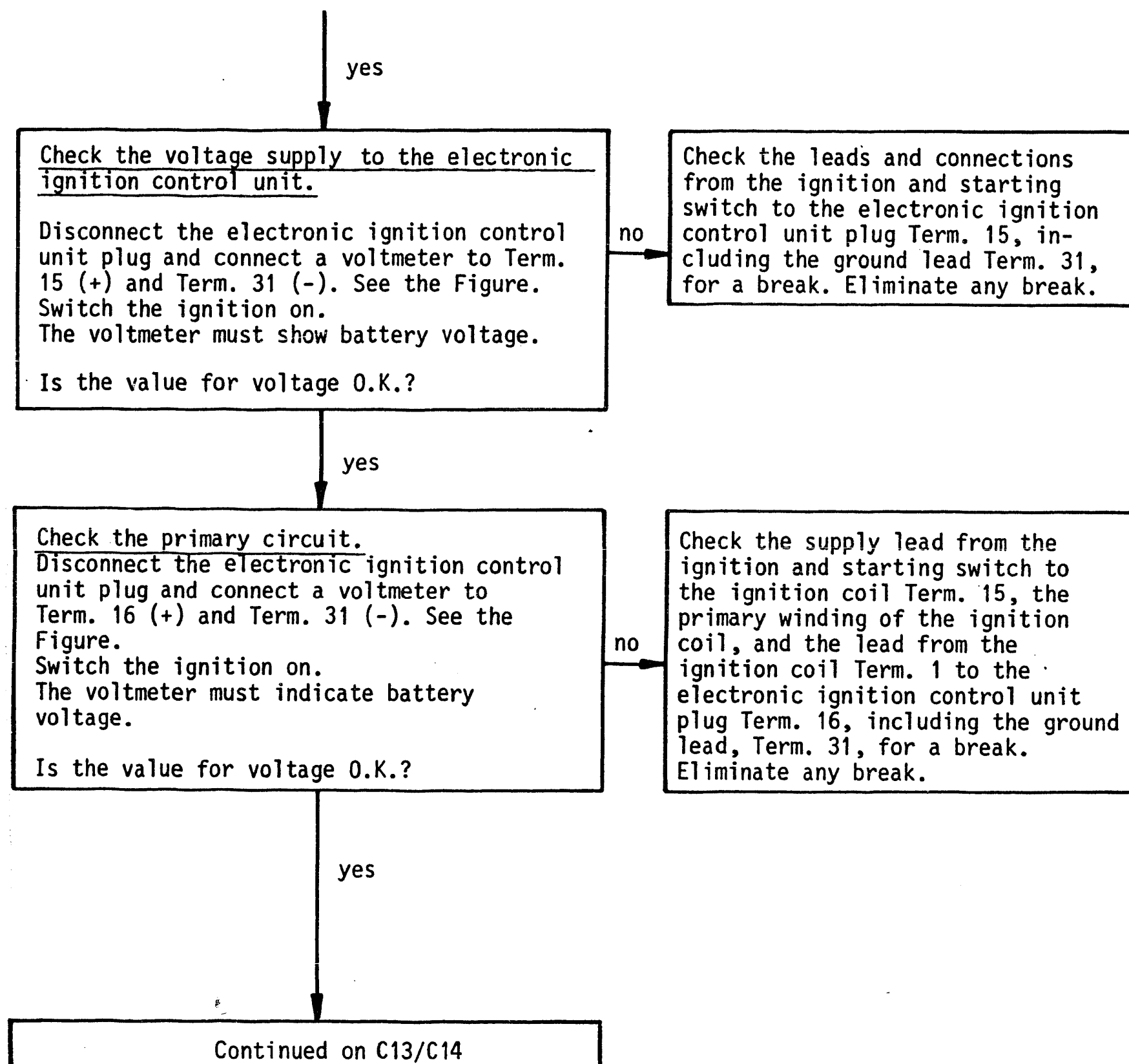
**C10**

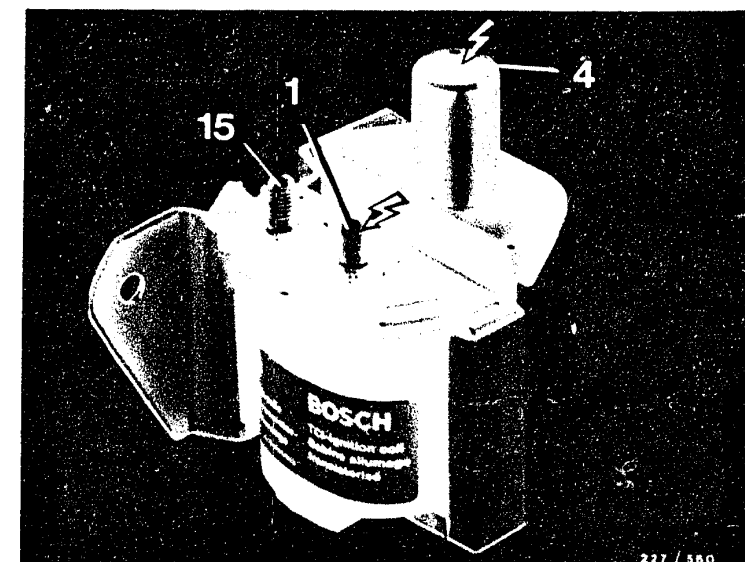
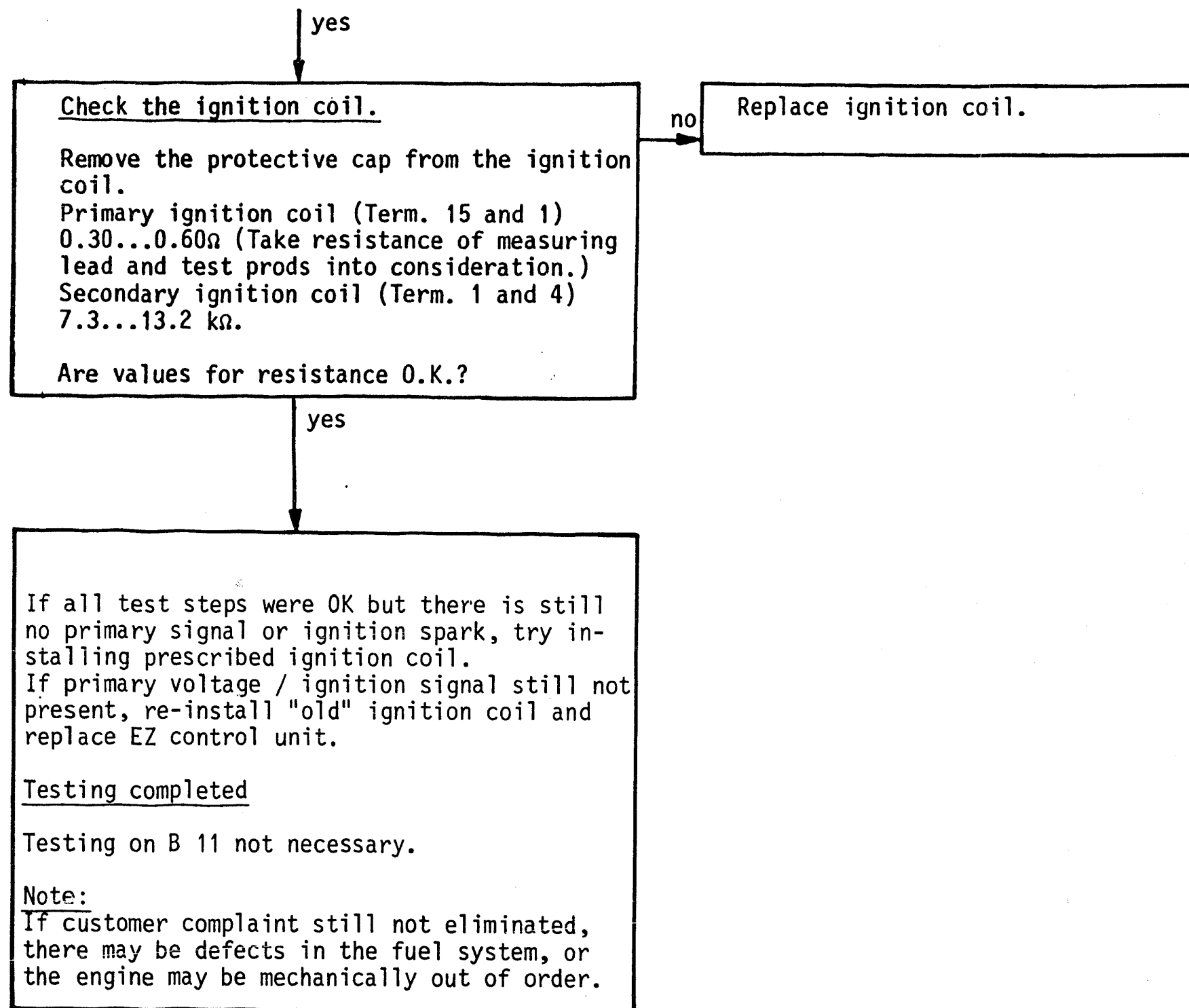
Trouble-shooting program  
Mercedes-Benz





8=Electronic ignition control unit plug





High voltage arrows:  
 Warning, 400 V ... 25 kV!

**C13**

Trouble-shooting program  
 Mercedes-Benz

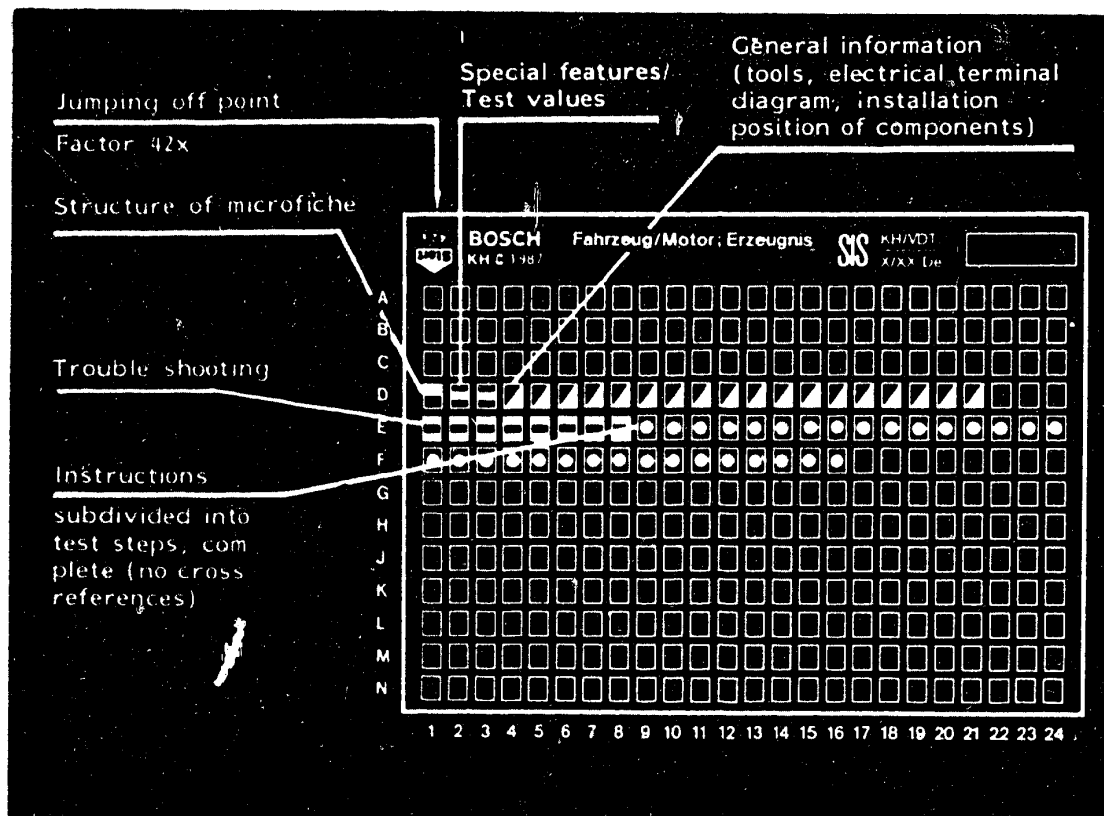


**C14**

Trouble-shooting program  
 Mercedes-Benz



## Structure of microfiche

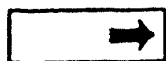


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

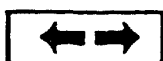
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

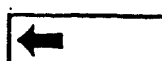
3. Limits of section



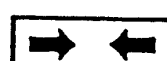
Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

**C6**

<b>D1</b>	Trouble-shooting program	
-----------	--------------------------	--

## 1. Special features

190E 2.3 - 16.4 cyl. engine 102.983, 1985 model year,  
USA, Japan,  
equipped with:

EI control unit 0 227 400 6.. (with current limitation)  
or  
Siemens co. control units (Daimler Benz AG service  
part)

Note: Bosch and Siemens control units are  
interchangeable.

Ignition coil 0 221 5..

## 2. Test specifications

Primary ignition coil	0.3 ... 0.6 $\Omega$	<b>E11</b>
Secondary ignition coil	7.3 ... 13.2 k $\Omega$	

Coolant-temperature + sensor	+ 20°C	2.1 ... 2.9 k $\Omega$	<b>E19</b>
	+ 30°C	1.4 ... 2.0 k $\Omega$	
	+ 80°C	280 ... 370 $\Omega$	
	+ 90°C	210 ... 280 $\Omega$	
	+ 100°C	160 ... 215 $\Omega$	

Spark advance without vacuum at 4000 $\pm$ 50 min <sup>-1</sup>	18 ... 22° VTDC	<b>E17</b>
--------------------------------------------------------------------	-----------------	------------

In order to prevent  
incorrect results, testing  
must be carried out per  
coordinate information

**E21**

**D2**

Test specifications

Mercedes-Benz



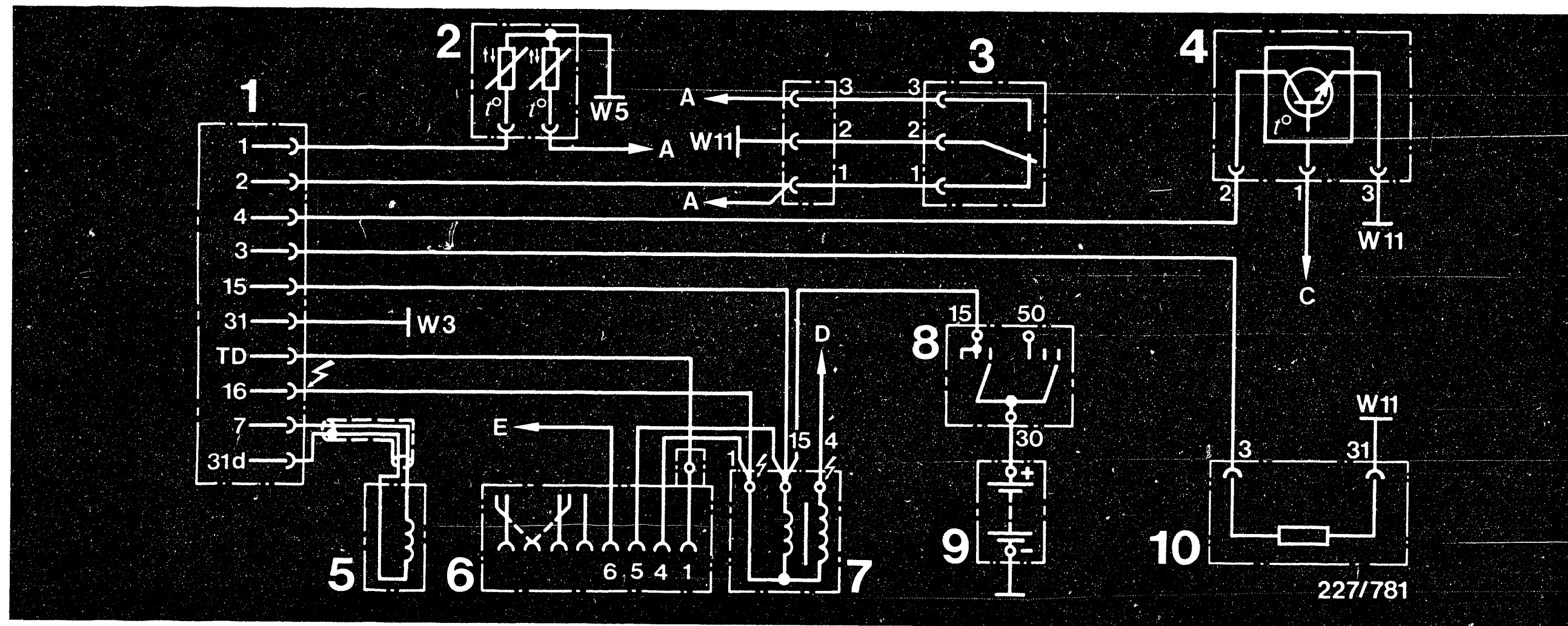
Adjustment plug	550 $\Omega$	<b>E23</b>
Intake-air temperature sensor	$> +25^{\circ}\text{C}$ 0 Volt $< +25^{\circ}\text{C}$ approx. $U_B$	<b>F1</b>
Voltage supply, EI control unit and ignition coil when engine idling	12 ... 14 V max. 1 V below $U_B$	<b>F5</b>
Primary voltage with engine idling	280 ... 360 V	<b>F9</b>
Internal resistance, Pulse generator Pulse generator insulation	680 ... 1200 $\Omega$ $\infty \Omega$	<b>F11</b>

See SIS microcard for Jetronic for setting values for idle speed, exhaust, etc.

**D3**

Test specifications  
Mercedes-Benz





High voltage arrows:  
Caution, 400 V ... 25 kV!

- 1 = Electronic ignition control unit
- 2 = Coolant temperature sensor (double NTC)
- 3 = Throttle valve switch
- 4 = Intake air temperature sensor (with electronic switch + 25°C)

- 5 = Pulse generator
- 6 = Diagnosis socket
- 7 = Ignition coil
- 8 = Ignition and starting switch
- 9 = Battery
- 10 = Adjustment plug 750 Ω

- A = To KE-Jetronic control unit
- B = To KE-Jetronic control unit
- C = To central electrics console coupling U no. 6 (term. 15 R)
- D = To high-voltage distributor
- E = To central electrics console coupling S no. 11 (term. 30)

- W3 = Wheel-well ground, left ignition coil
- W5 = Engine ground
- W11 = Engine ground (at engine fan)

### 3. Electrical connection diagram

**D4**

Electrical terminal diagram  
Mercedes-Benz

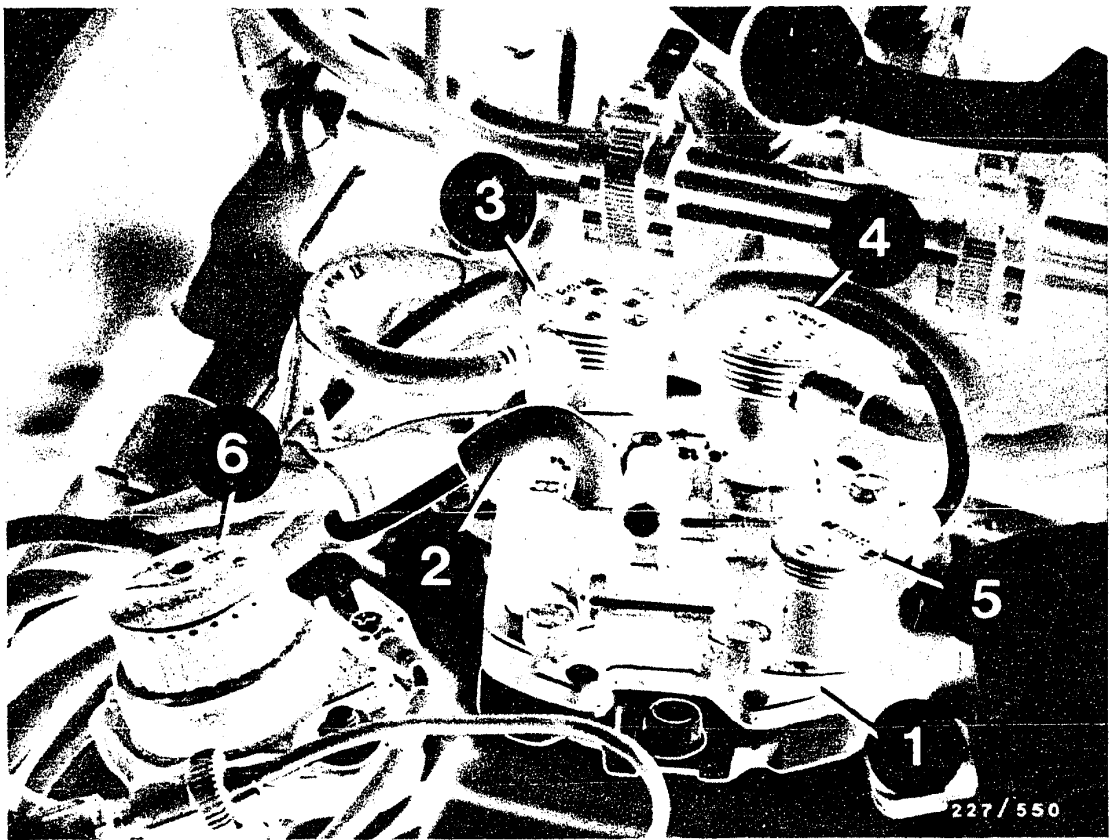


**D5**

Electrical terminal diagram  
Mercedes-Benz





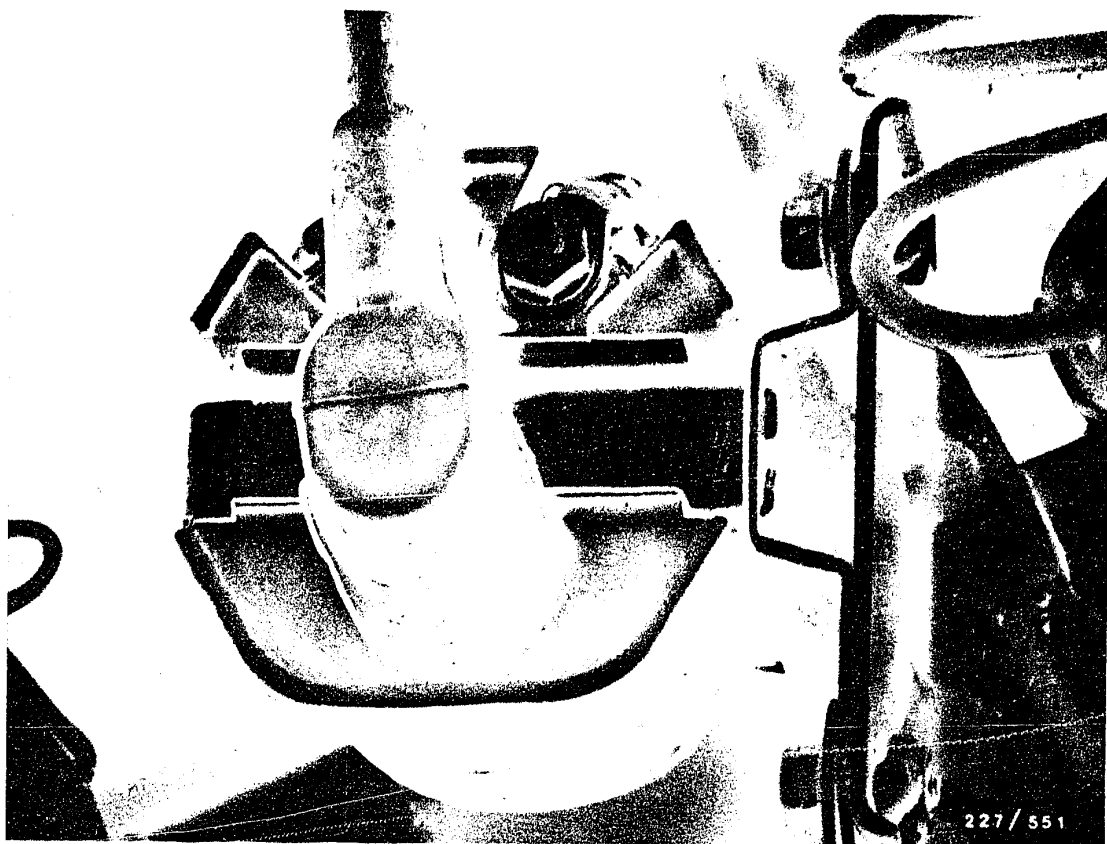


- 1 = Electronic ignition control unit
- 2 = Vacuum hose
- 3 = Quadruple plug - power supply
- 4 = Quadruple plug - sensor
- 5 = Coaxial plug - pulse generator
- 6 = Diagnosis socket

#### 4. Installation position of the components

The electronic ignition control unit and the diagnosis socket are located on the wheel housing on the left, looking in direction of forward vehicle travel.





Plastic ignition coil

**D7**

Installation position of components

Mercedes-Benz





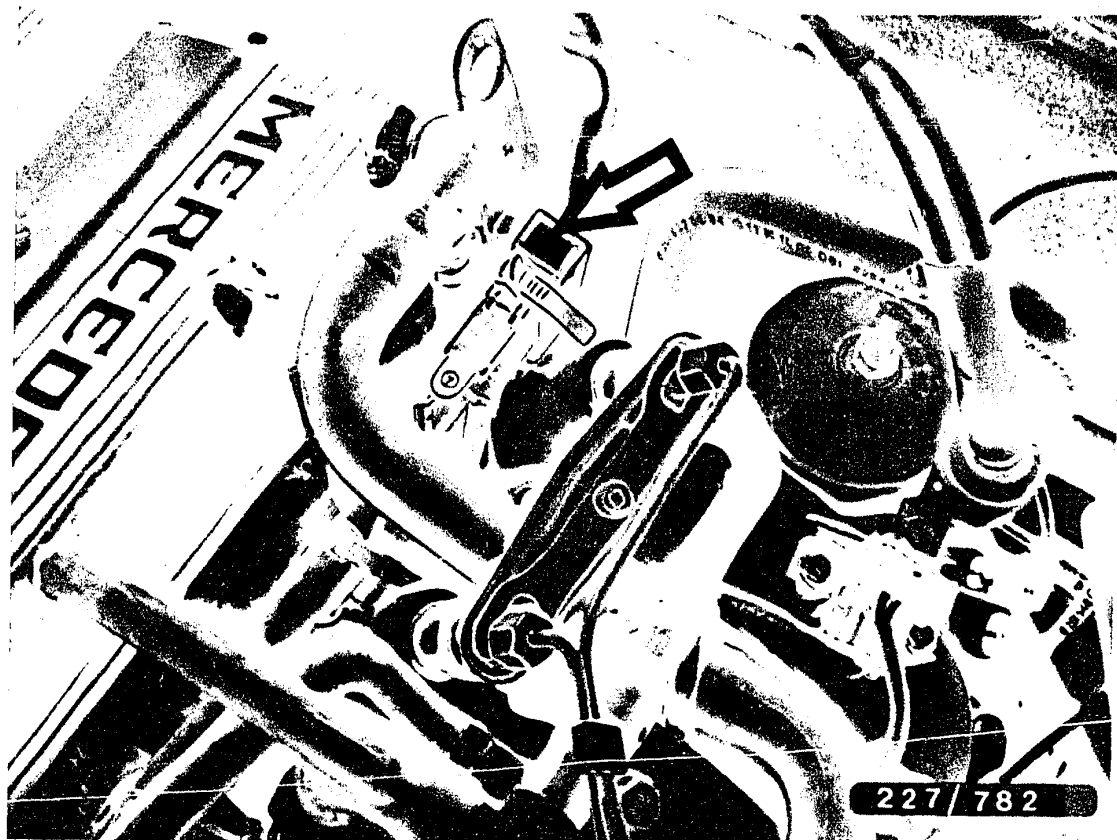
Arrow = Pulse generator

The pulse generator is located on the engine block on the left, looking in the direction of forward vehicle travel (below the oil filter).

**D8**

Installation position of components  
Mercedes-Benz





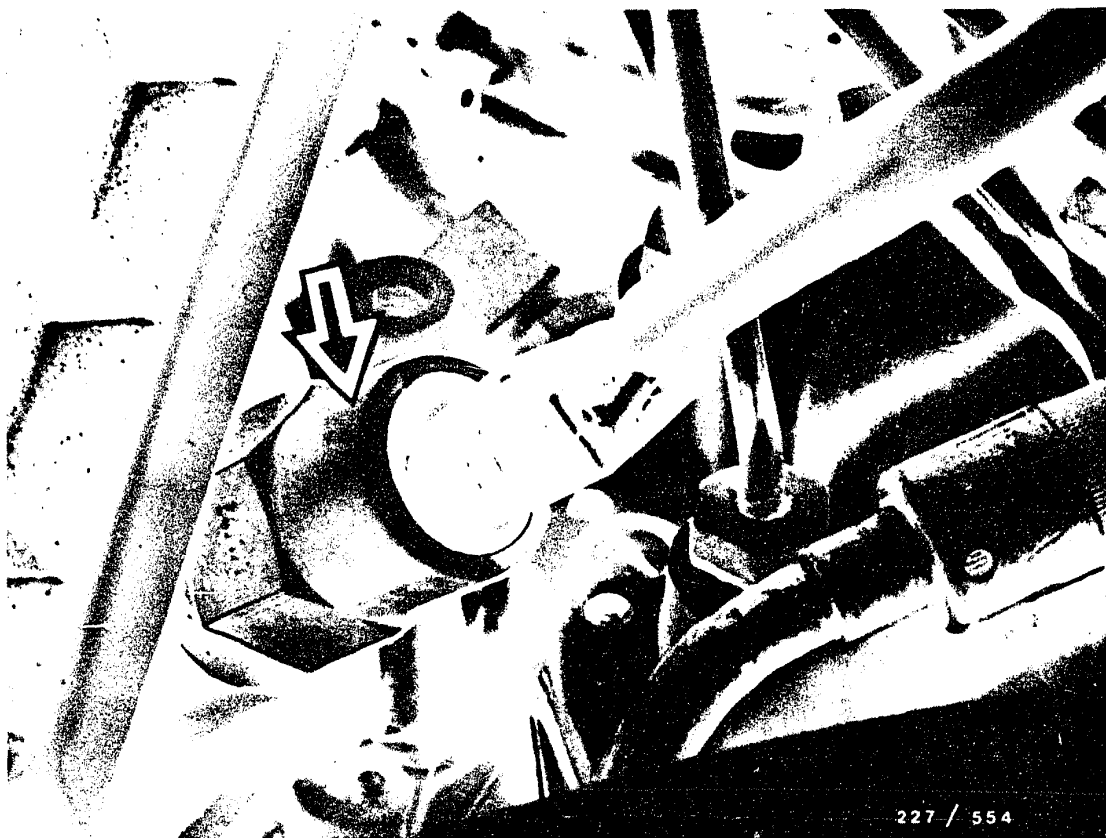
Arrow = Adjustment plug, ignition

**D9**

Installation position of components

Mercedes-Benz





227 / 554

Arrow = Intake air temperature sensor with electronic switch + 25°C

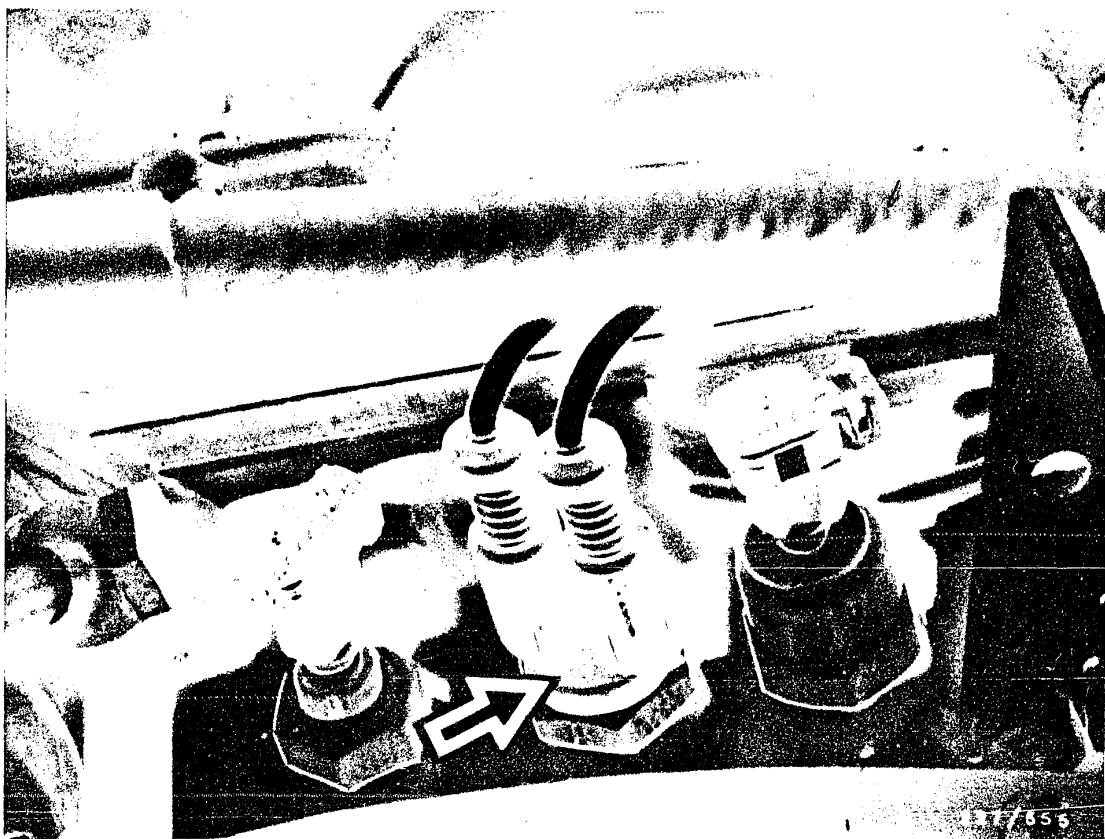
The intake air temperature sensor is located on the air filter.

**D 10**

Installation position of components

Mercedes-Benz





Arrow = Coolant temperature sensor (double NTC)

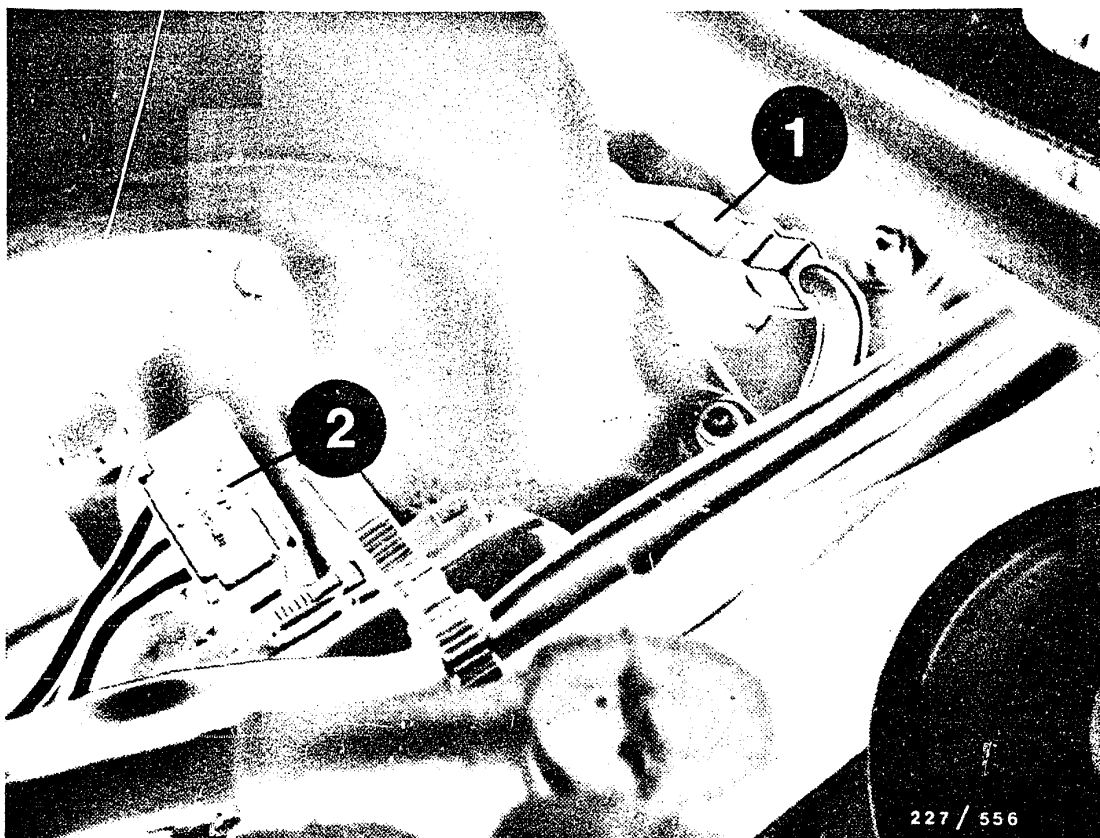
The coolant temperature sensor is located at the front on the cylinder head (thermostat housing).

**D11**

Installation position of components

Mercedes-Benz





1 = Throttle-valve switch

2 = Plug connection from the throttle valve switch

The throttle-valve switch is located on the throttle-valve assembly.



## 5. Required test equipment and aids

Motortester, e.g.	MOT 201	0 684 000 201
Adapter lead for diagnosis socket		1 684 463 094
Pulse shaper (required for measuring primary voltage with MOT 201, 202, 206 for 400)		1 684 463 154
Spark gap, e.g. ignition coil - condenser tester or	EFAW 106 A	0 681 100 001
Single spark gap	EF 1177/7	1 684 531 000
Sleeve-type suppressor 5 k $\Omega$		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or, for example	Pontavi Wh 2	commercially available
Voltmeter, e.g.	ETE 014.00	0 684 101 400
Thermal conduction paste		5 942 860 003
Test prod, black		1 684 485 034
Test prod, red (for correctly connecting test equipment to plug connections)		1 684 485 035
Cold spray Hot-air blower or soldering gun	Testing intake-air- temperature sensor	commercially available commercially available





## 6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

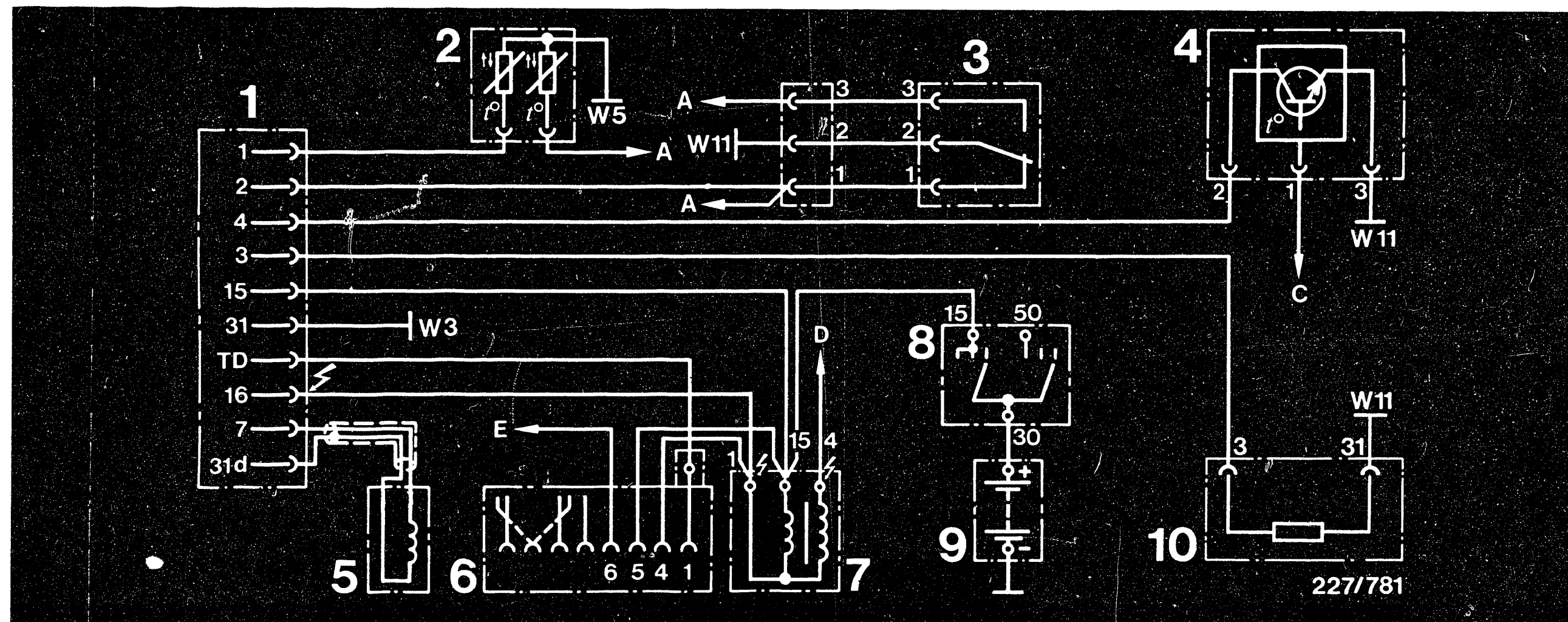
The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. KE-Jetronic), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.





High voltage arrows:  
Caution, 400 V ... 25 kV!

- 1 = Electronic ignition control unit
- 2 = Coolant temperature sensor (double NTC)
- 3 = Throttle valve switch
- 4 = Intake air temperature sensor (with electronic switch + 250C)

- 5 = Pulse generator
- 6 = Diagnosis socket
- 7 = Ignition coil
- 8 = Ignition and starting switch
- 9 = Battery
- 10 = Adjustment plug 750  $\Omega$

- A = To KE-Jetronic control unit
- B = To KE-Jetronic control unit
- C = To central electrics console coupling U no. 6 (term. 15 R)
- D = To high-voltage distributor
- E = To central electrics console coupling S no. 11 (term. 30)

- W3 = Wheel-well ground, left ignition coil
- W5 = Engine ground
- W11 = Engine ground (at engine fan)

### Electrical connection diagram

The hazard locations are identified with high voltage arrows using, as an example, the connection diagram for an electronic ignition system.

**D15**

Accident hazard  
Mercedes-Benz



**D16**

Accident hazard  
Mercedes-Benz



7. Incorrect indication of engine speed, dwell angle and ignition point

In the case of ignition systems with control unit 0 227 400 6.. or control units from Siemens (electronic ignition) with current limitation, there can be an incorrect reading for engine speed, dwell angle, and ignition timing on the test instruments.

For further details see coordinates N 7 - N 10



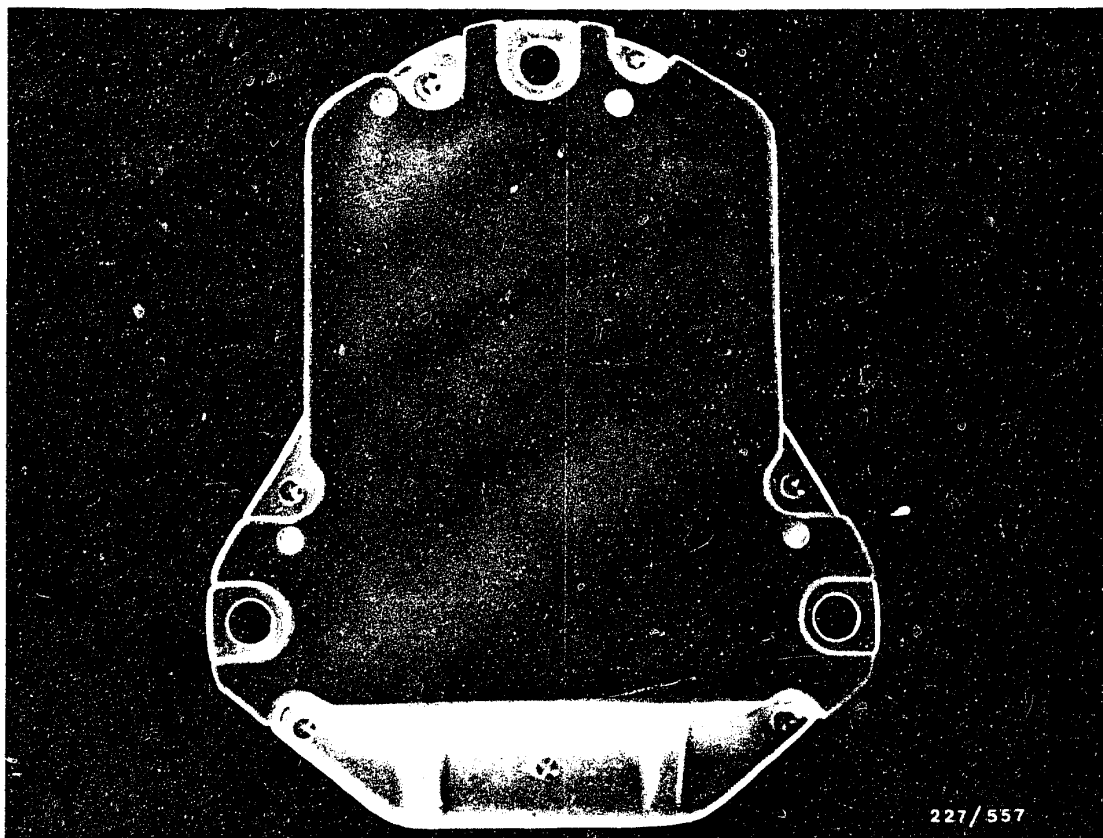
## 8. Important vehicle information

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- For a compression test, disconnect the coaxial plug (pulse generator) from the electronic ignition control unit.
- Never disconnect the battery while the engine is running.
- A starting assist with more 16 Volts or with a quick-charger is not permitted.
- The specified ignition coil (see Part.No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (the electronic ignition control unit is destroyed).
- The ignition lead from the ignition coil Term. 4 to the high voltage distributor Term. 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15.  
The electronic ignition control unit can be destroyed.



- If the poles are reversed on the ignition coil (Term. 1 and Term. 15) there are severe losses of ignition energy, causing missing. In addition, the electronic ignition control unit is overloaded. In order to preclude reversal of poles, the terminal studs have different diameters. (M5 and M6)
- In order to avoid destruction of the electronic ignition control unit, the secondary end of the ignition system must have interference suppression of min. 2 k $\Omega$ . The original distributor rotor must be installed with an interference suppression resistor of 1 k $\Omega$ . (Do not use a 5 k $\Omega$  distributor rotor for radio and interference suppression either.)
- If the poles on the battery are incorrectly connected, the electronic ignition control unit and the ignition coil are destroyed.





227/557

- Before putting on the electronic ignition control unit, the base plate (see the Figure, bright surface) must be coated with a heat conduction paste. Before mounting the trigger box, the base plate must be coated with thermal conduction paste. Apply thermal conduction paste only with a suitable object (screwdriver, etc.).

Do not apply thermal conduction paste to painted parts.





## 9. Trouble-shooting

### 9.1 How to use the trouble-shooting chart

The trouble-shooting chart starting on Coordinate E 3 contains customer complaint (fault symptom), cause of trouble, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate E 9.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.

If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

### 9.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate E9 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 9.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

**E1**

Trouble-shooting  
Mercedes-Benz



**E2**

Trouble-shooting  
Mercedes-Benz





## 9.4 Trouble-shooting chart

### Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinat.

●	●	●	●	●	●	●	●	●	Unclear	Perform detailed trouble-shooting	E 9
●	●	●	●	●	●	●	●		Spark plugs defective	Assessment by means of ignition oscilloscope or visual examination of spark plug when removed	----
●	●	●	●	●					Shunt on secondary side	Evaluation of the ignition coil, high voltage distributor, ignition harness, and spark plug by means of the ignition oscillogram or a visual inspection	----
●	●	●	●	●					Open circuit on secondary side	Assessment of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope, or continuity test with ohmmeter	----
●									Open circuit on primary side	--	F 13
●	●	●	●	●					Ignition coil defective	-	E 11
		●	●	●	●				Interference-suppression resistors defective	Assessment by means of ignition oscilloscope or resistance measurement	----

**E3**

Trouble-shooting chart

Mercedes-Benz



**E4**

Trouble-shooting chart

Mercedes-Benz



# Trouble-shooting chart (continued)

## Customer complaint (fault symptom)

- |    |                                              |
|----|----------------------------------------------|
| 1. | Starting motor cranks, engine does not start |
| 2. | Rough idling                                 |
| 3. | Poor throttle response                       |
| 4. | Engine lacks power                           |
| 5. | Misfiring                                    |
| 6. | Excessive fuel consumption                   |
| 7. | Engine pings during acceleration             |
| 8. | Backfiring                                   |
| 9. | Engine becomes too hot                       |

								Cause of trouble	Test instructions	Coordinates
●							●	Incorrect firing sequence	See Autodata test specifications	---
●		●		●			●	High-voltage distributor incorrectly adjusted	---	E 13
●								Contact resistance, ignition coil/EI control unit defective	---	E 15
			●		●	●	●	Pressure sensor defective	---	E 17
			●		●			Coolant-temperature sensor defective	---	E 19
			●		●	●		Incorrect spark advance	To prevent incorrect results, testing must be carried out per coordinate information.	E 17...E 21
						●		Intake-air-temperature sensor defective	---	F 1
			●		●	●	●	Throttle-valve switch (idle contact) defective.	---	F 3

**E5**

Trouble-shooting chart

Mercedes-Benz



**E6**

Trouble-shooting chart

Mercedes-Benz



# Trouble-shooting chart (continued)

## Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start
2. Rough idling
3. Poor throttle response (flat spot during acceleration)
4. Insufficient engine power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine overheats

									<u>Cause of trouble</u>	<u>Test instructions</u>	<u>Coordinates</u>
				●					Electronic ignition control unit not O.K.	---	F 9
●									Pulse generator not O.K.	---	F 11
●									Voltage supply to electronic ignition control unit not O.K.	---	F 13

**E7**

Trouble-shooting chart  
Mercedes-Benz



**E8**

Trouble-shooting chart  
Mercedes-Benz



## 9.5 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Remove the protective cap from the ignition coil.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

Primary signal present or ignition sparks across spark gap?

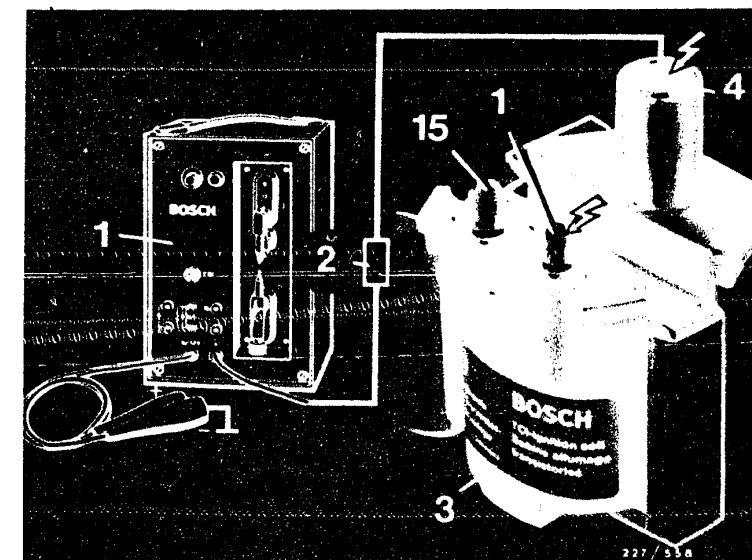
yes

Continued on E11/E12

no

If no primary signal or no ignition spark, continue testing at F11.

Tests from E11 onwards not necessary.



High voltage arrows:

Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 k $\Omega$  sleeve-type suppressor

3 = ignition coil

E9

Trouble-shooting program

Mercedes-Benz

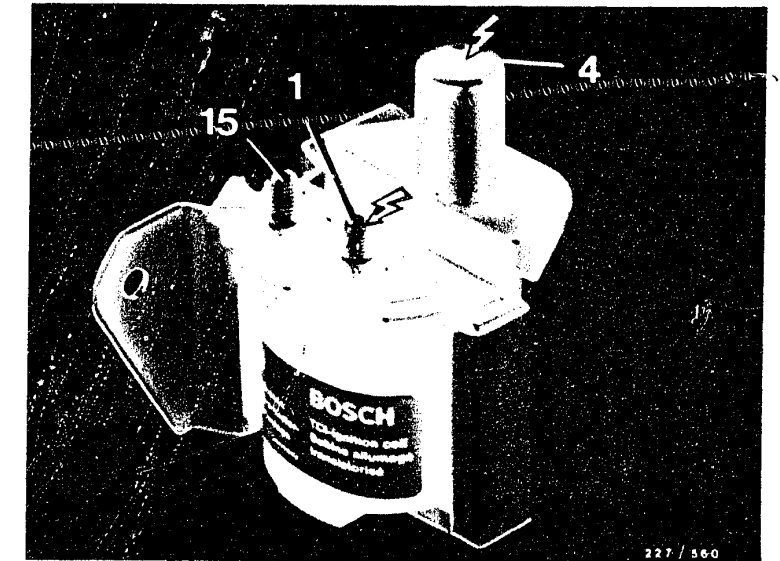
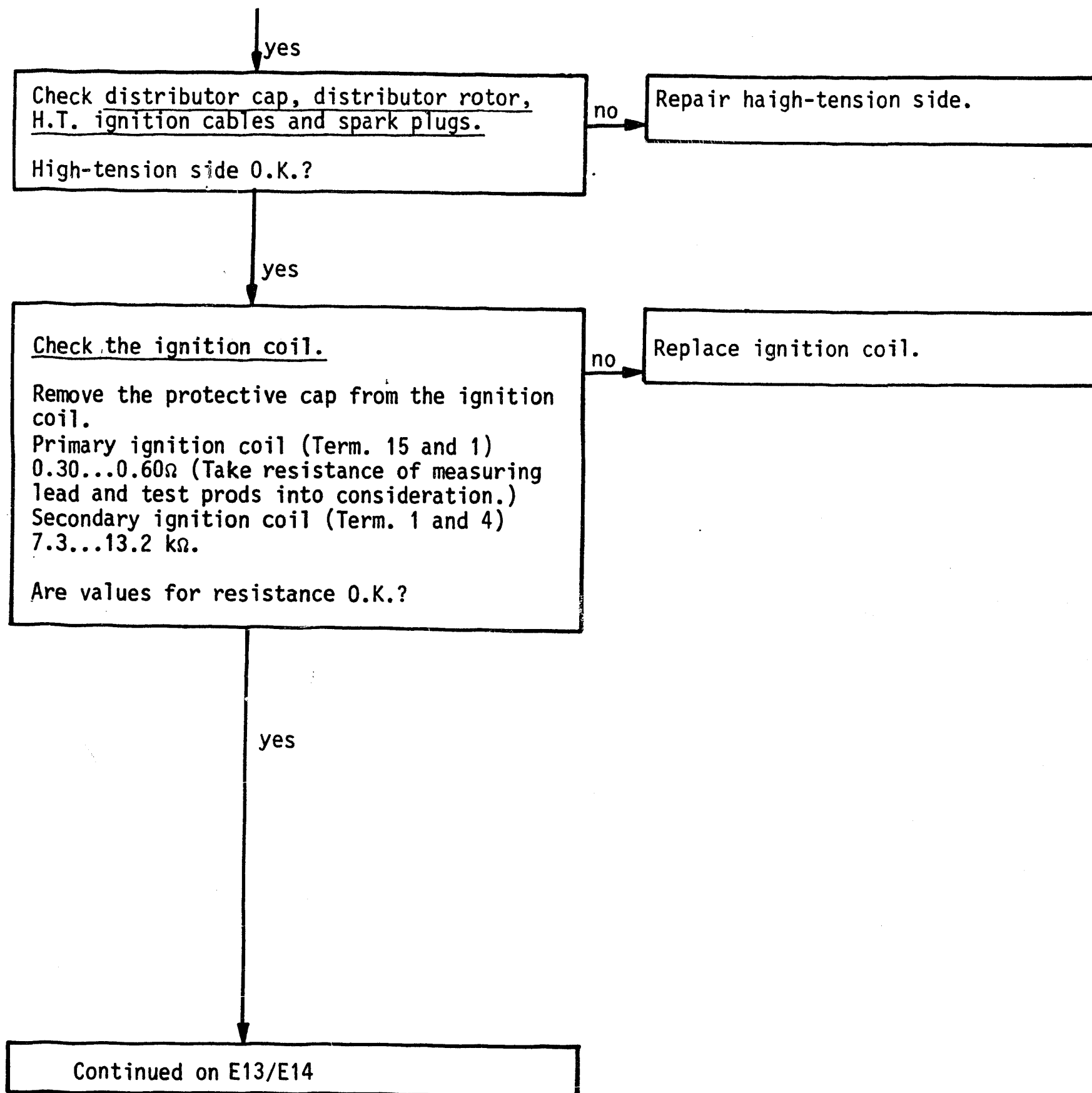


E10

Trouble-shooting program

Mercedes-Benz





High voltage arrows:  
Warning, 400 V ... 25 kV!

**E11**

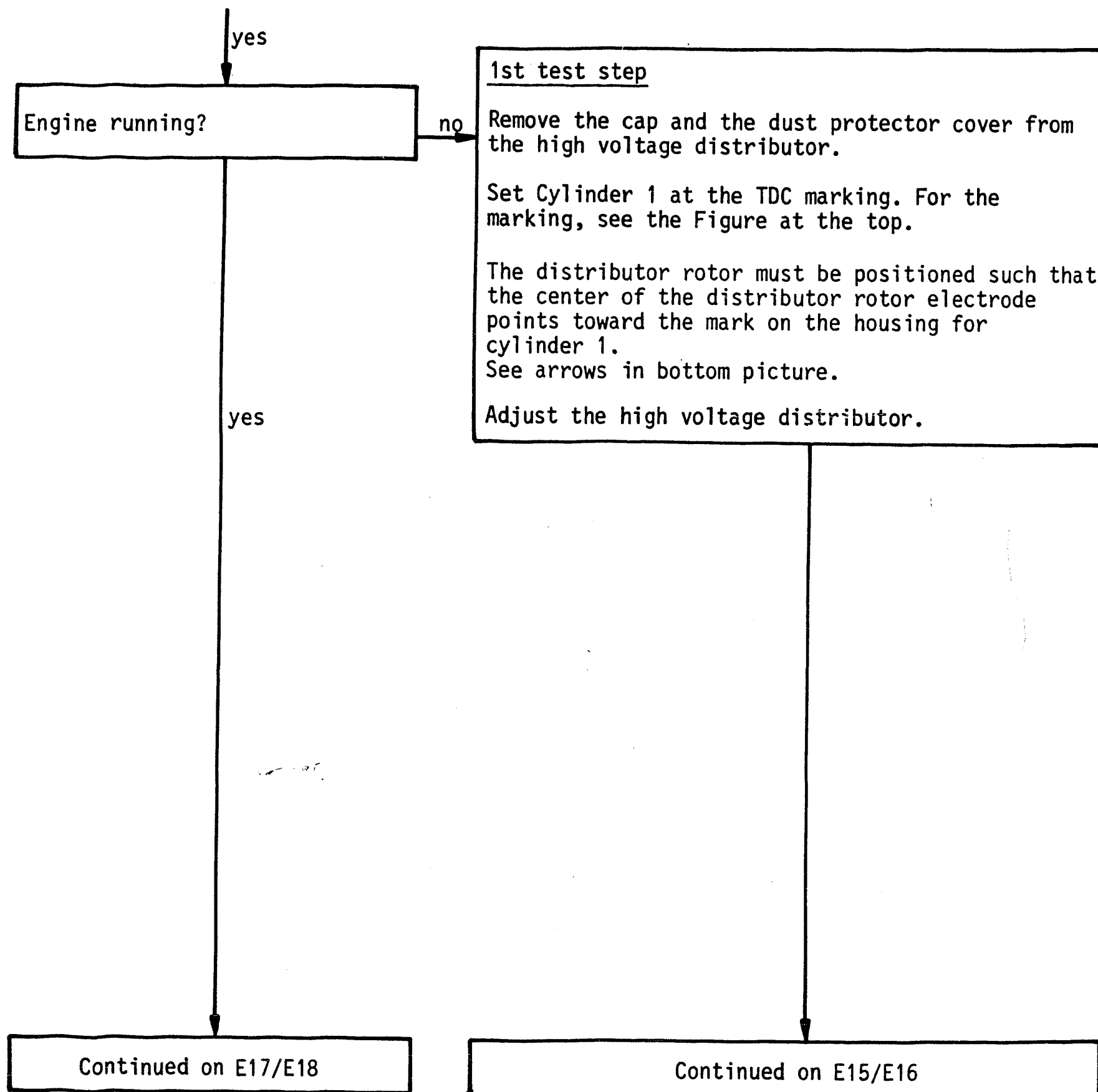
Trouble-shooting program  
Mercedes-Benz



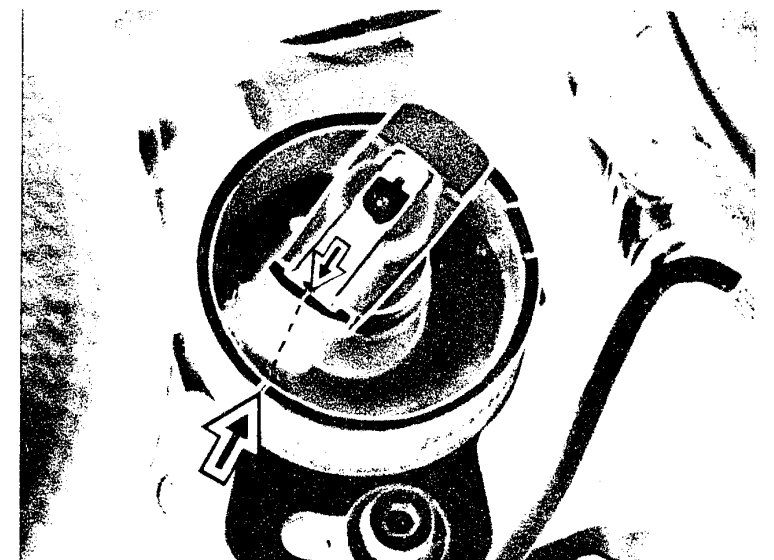
**E12**

Trouble-shooting program  
Mercedes-Benz





Arrow=TDC marking



**E13**

Trouble-shooting program  
Mercedes-Benz



**E14**

Trouble-shooting program  
Mercedes-Benz



continued

2nd test step

Disconnect the negative and positive leads from the battery.

Disconnect the electronic ignition control unit plug. Switch the ignition on.

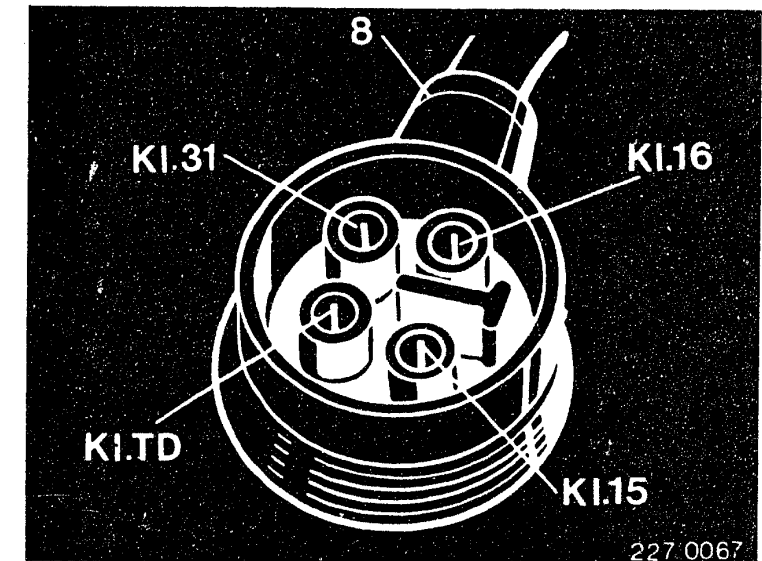
1. Check the leads from the positive battery terminal to the electronic ignition control unit plug Term. 15 and the leads from the negative battery terminal to the electronic ignition control unit plug Term. 31 for contact resistances. Max. total contact resistance 0.3Ω. (Take resistance of measuring lead into consideration.) Eliminate contact resistances.

2. Check the leads from the positive battery terminal to the ignition coil Term. 15 and the lead from the ignition coil Term. 1 to the electronic ignition control unit plug Term. 16 for contact resistance. Max. total contact resistance 0.3 Ω. (Take the resistance of the measuring lead into consideration.) Eliminate any contact resistance.

3. If points 1 and 2 were OK, try installing prescribed ignition coil. If engine still does not run, re-install "old" ignition coil and replace EI control unit.

yes

Continued on E17/E18



8=Electronic ignition control unit plug  
KI.=Term.

**E15**

Trouble-shooting program  
Mercedes-Benz



**E16**

Trouble-shooting program  
Mercedes-Benz



yes

### Check the pressure sensor

Connect the motortester to the diagnosis socket using an adapter cable. Disconnect the vacuum hose from the electronic ignition control unit. See the Figure at the top.

Take the plug connection from the throttle valve switch apart. See the Figure at the bottom. Run the engine at idle.

Take reading for timing angle.

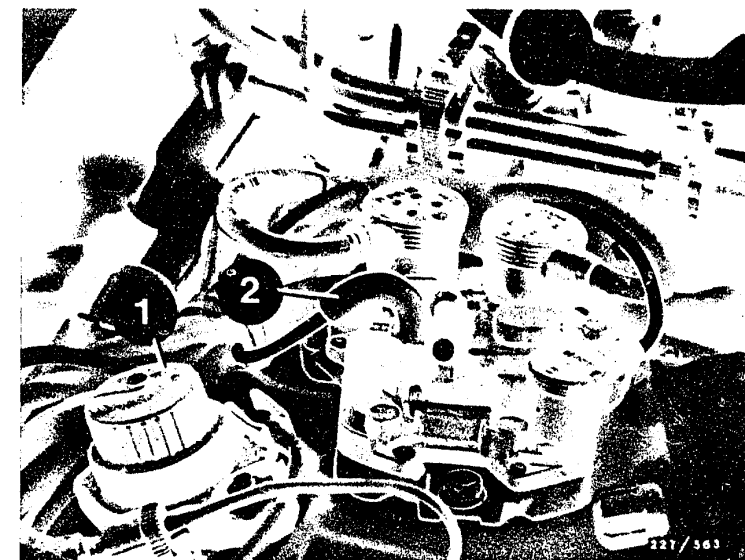
Put the vacuum hose back on the electronic ignition control unit. When this is done, the timing angle must change noticeably (in the direction "advance").

Did the timing angle change?

no

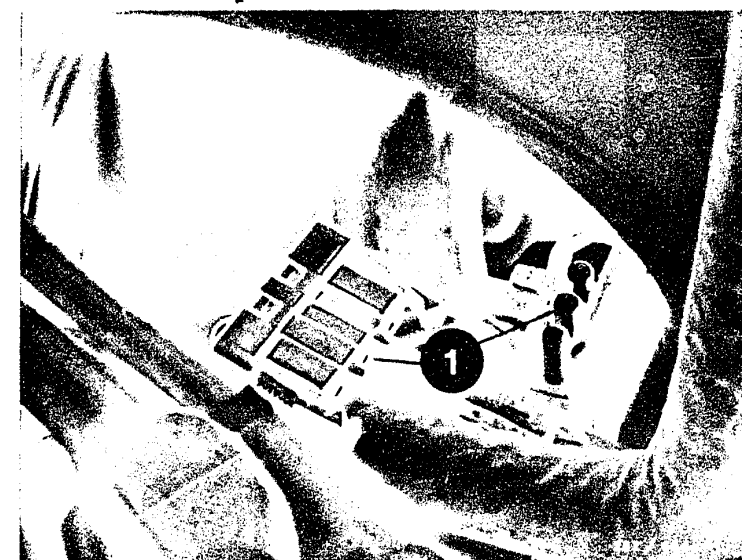
1. Check the vacuum hose from the electronic ignition control unit to the intake manifold plug connection for leaks. Eliminate any leaks.

2. If there was no leak, take out and replace the electronic ignition control unit.



1=Diagnosis socket  
2=Vacuum hose

1=Plug connection from the throttle valve switch



Continued on E19/E20

yes

**E17**

Trouble-shooting program  
Mercedes-Benz



**E18**

Trouble-shooting program  
Mercedes Benz





yes

Check the coolant temperature sensor.

Warm the engine up to normal operating temperature.  
Connect the motortester to the diagnosis socket using an adapter lead.  
Disconnect the vacuum hose at the electronic ignition control unit. Disconnect the intake air temperature sensor plug. See the Figure at the top.  
Run the engine at  $3200 \text{ min}^{-1}$ . Take reading for timing angle.  
Disconnect the coolant temperature sensor plug (color of cable green/black). See Figure at the center.  
When this is done, the timing angle must change.

Did the timing angle change?

yes

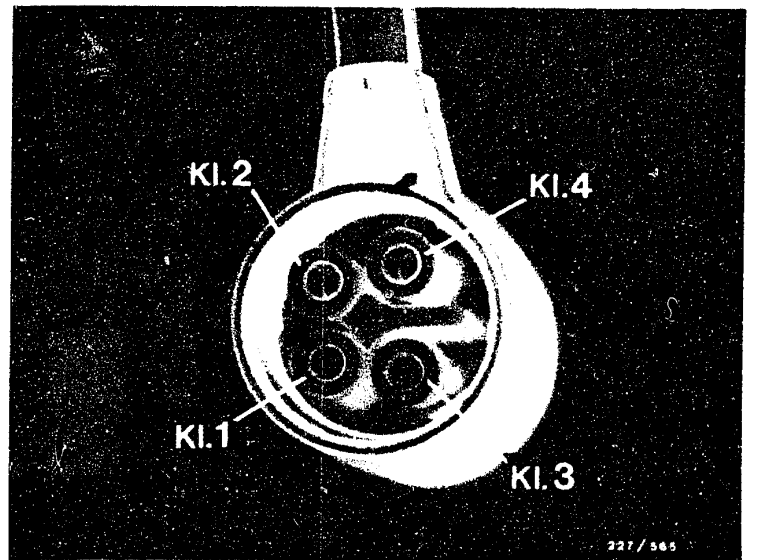
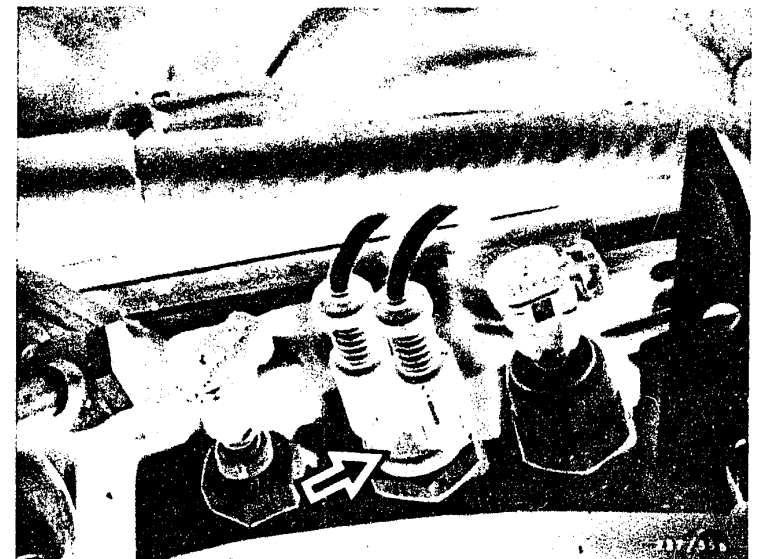
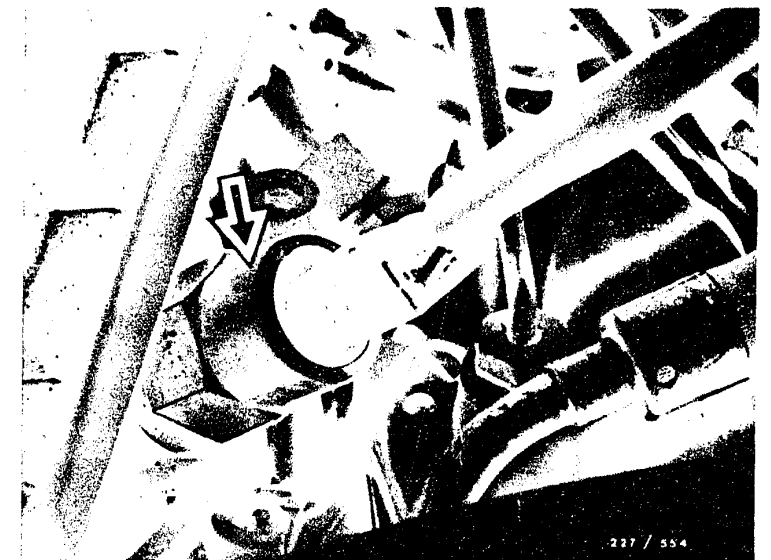
Continued on E21/E22

no

Switch the ignition off.  
Disconnect the electronic ignition control plug and connect an ohmmeter to Term. 1 (Figure at bottom) and vehicle ground.  
For resistances, see the table.

Coolant temperature		Resistance
+ 20°C	=	2.1...2.9 kΩ
+ 30°C	=	1.4...2.0 kΩ
+ 80°C	=	280...370 Ω
+ 90°C	=	210...280 Ω
+100°C	=	160...215 Ω

If the ohmmeter reads  $\infty\Omega$ , then check the lead from the coolant temperature sensor plug (color of cable green/black) to the electronic ignition control unit plug Term. 1 for continuity. Eliminate any break. If the values for resistance deviate, take out and replace the coolant temperature sensor.



E19

Trouble-shooting program  
Mercedes-Benz



E20

Trouble-shooting program  
Mercedes-Benz



yes

Check spark advance.  
Engine at operating temperature.  
Motortester connected to diagnostic socket  
(upper illustration, pos. 1) with adapter  
lead.  
Vacuum hose (upper illustration, pos. 2) from  
EI control unit is pulled.  
Intake-air-temperature sensor (center  
illustration) is disconnected.  
Plug connection from throttle-valve switch  
(see lower illustration pos. 1) is  
disconnected.

Operate engine at  $4000 \pm 50 \text{ min}^{-1}$ .  
Spark advance  $18 \dots 22^\circ\text{C BTDC}$

Spark advance OK?

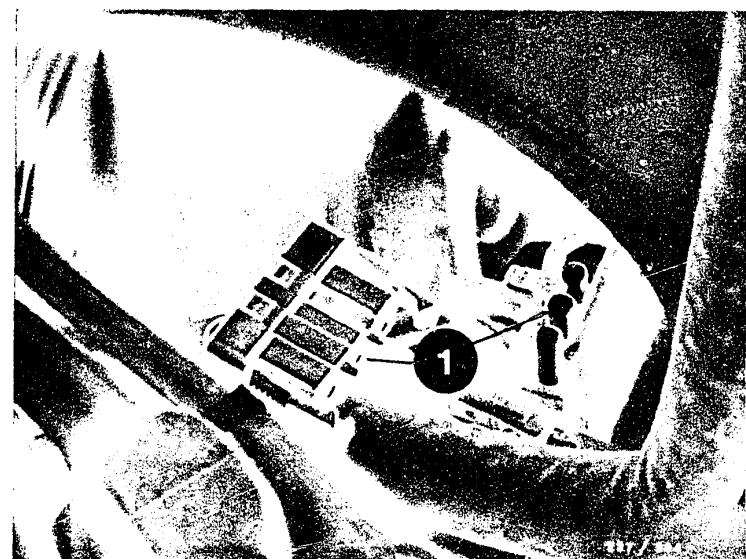
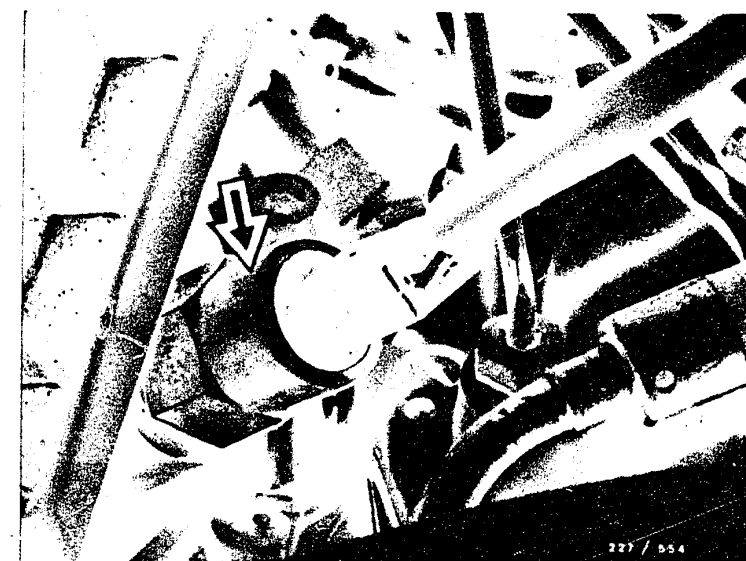
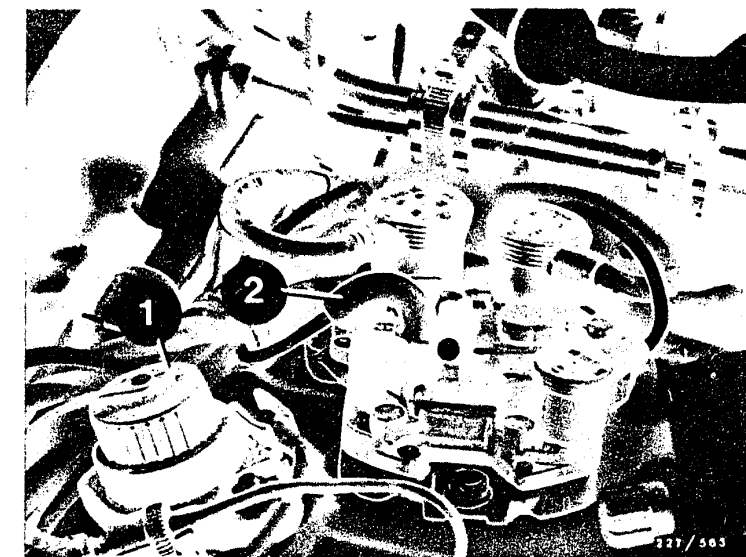
no

Switch off ignition.

yes

Continued on F1/F2

Continued on E23/E24



**E21**

Trouble-shooting program

Mercedes-Benz



**E22**

Trouble-shooting program

Mercedes-Benz



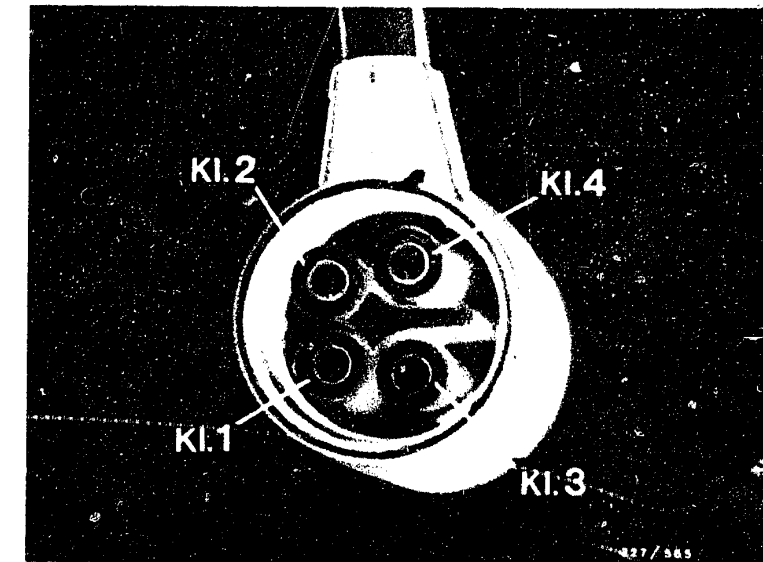
continued

Pull EI control unit plug and connect ohmmeter to term. 3 and vehicle ground. See upper illustration. Resistance 750  $\Omega$

If resistance is OK, replace EI control unit.

If resistance is approx. 0 $\Omega$  or  $\infty\Omega$ , check adjustment plug including electric cables for ground connections or open circuits. Eliminate defects.

If resistance is outside tolerance replace adjustment plug.

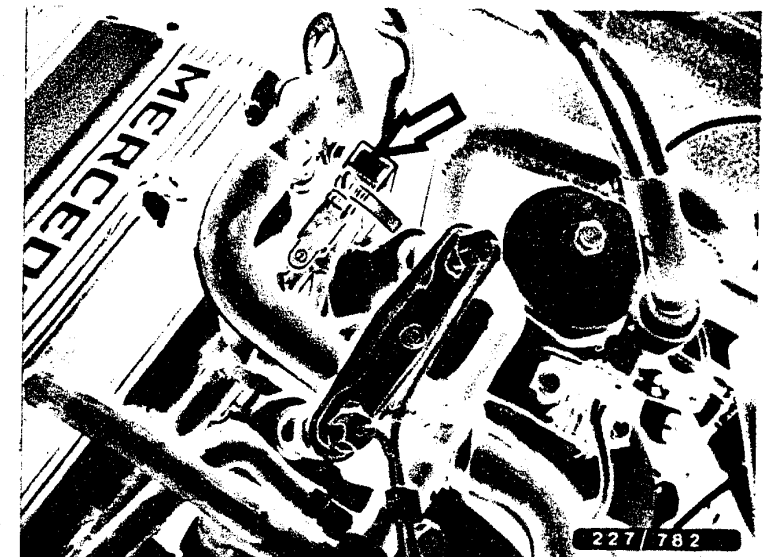


EI control unit plug

yes

Continued on F1/F2

Adjustment plug



**E23**

Trouble-shooting program  
Mercedes-Benz



**E24**

Trouble-shooting program  
Mercedes-Benz



yes

Check the intake air temperature sensor.

1. Switch the ignition off.

Remove the top portion of the air filter. Disconnect the electronic ignition control unit plug and connect a voltmeter to Term. 4 (-) and battery terminal (+). See the Figure at the top. Switch the ignition on.

Carefully heat the intake air temperature sensor with a suitable source of heat (e.g. a soldering gun, a hair-dryer), to  $> + 25^{\circ}\text{C}$ . See Figure at center.

The voltmeter must read approx. 0 V.

2. Cool the intake air temperature sensor to  $< + 25^{\circ}\text{C}$  (e.g. with a refrigerant spray).

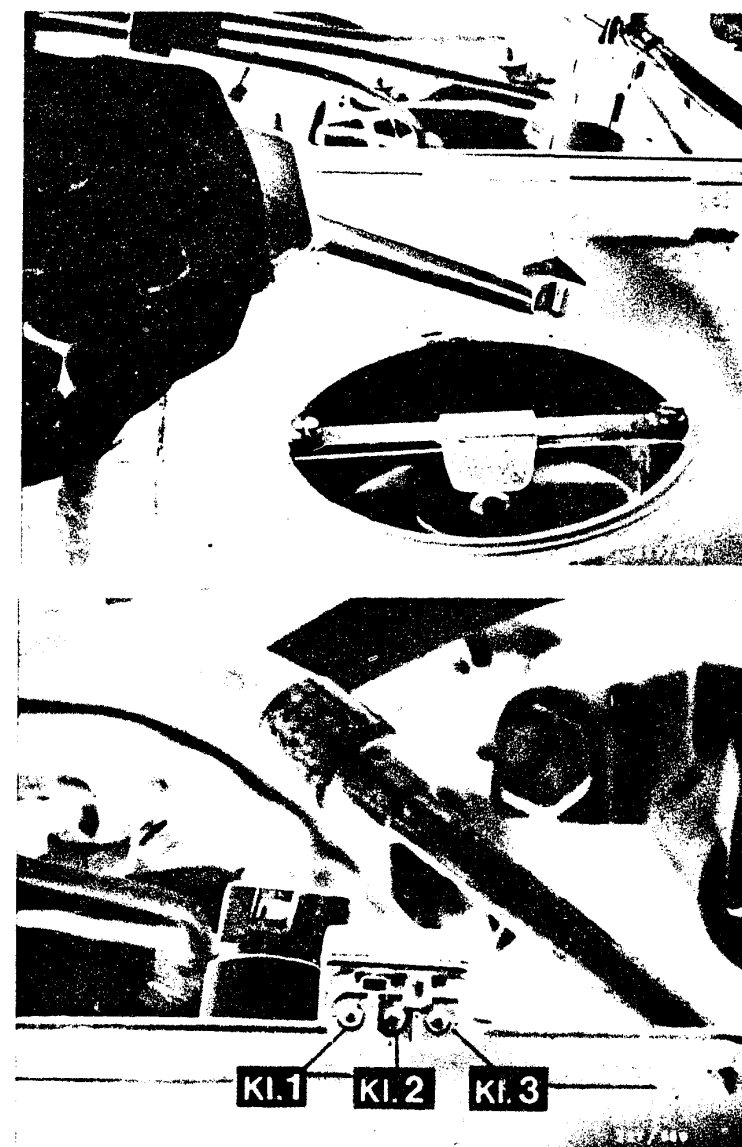
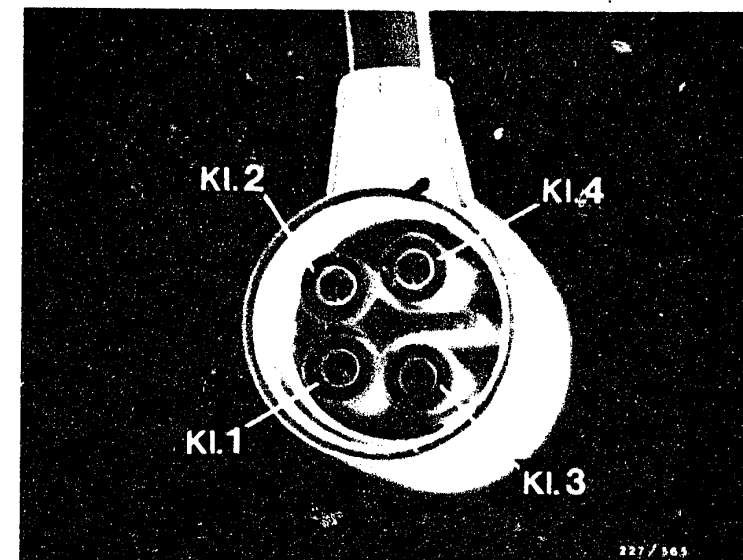
The voltmeter must read approx. battery voltage. Are the voltages in points 1 and 2 O.K.?

no

Disconnect the intake air temperature sensor plug. See the Figure at the bottom. Check the lead from Term. 1 (+) and Term. 3 (-) from the intake air temperature sensor to the electronic ignition control unit plug Term. 4 for a break. Eliminate any break. If there was no break present, take out and replace the intake air temperature sensor.

yes

Continued on F3/F4



F1

Trouble-shooting program

Mercedes-Benz



F2

Trouble-shooting program

Mercedes-Benz



yes

Check idle contact from throttle-valve switch.  
Switch off ignition.  
Pull KE-Jetronic control unit plug (not illustrated).  
Pull EI control unit plug and connect ohmmeter to term. 2 and vehicle ground. See upper illustration.  
Plug connection from throttle-valve switch is connected. Throttle valve is in idle position.  
Ohmmeter should show approx.  $0\ \Omega$  (current flow).  
Open throttle valve.  
Ohmmeter should show  $\infty\Omega$ .

Is resistance OK?

no

1. Disconnect the plug connection from the throttle valve switch. See lower illustration. Connect an ohmmeter one after the other to:

Throttle valve switch plug connection (Middle illustr.)	Electronic ignition control unit plug
---------------------------------------------------------	---------------------------------------

Term. 1 and Term. 2	Term. 2 and vehicle ground
---------------------	----------------------------

The ohmmeter must read approx.  $0\ \Omega$  (continuity). Eliminate any break.

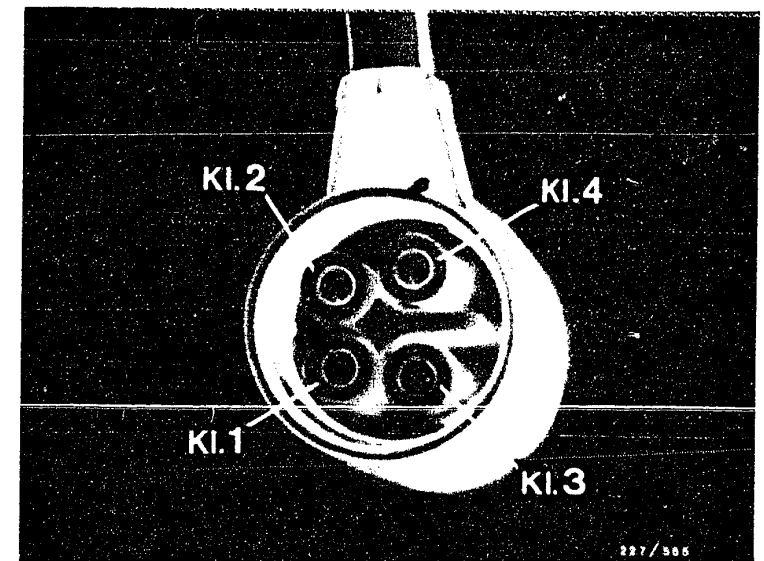
2. Connect the ohmmeter to the throttle valve switch plug connection Term. 1 and Term. 2. See the Figure at the bottom. The throttle valve is closed.  
Resistance approx.  $0\ \Omega$

Open the throttle valve. The ohmmeter must read  $\infty\Omega$ .

If the resistance is not O.K., adjust the throttle valve switch or take it out and replace it.

yes

Continued on F5/F6



F3

Trouble-shooting program  
Mercedes-Benz



F4

Trouble-shooting program  
Mercedes-Benz



yes

Check the voltage supply to the electronic ignition control unit and the ignition coil.

Connect the voltmeter and test prod to the diagnosis socket Term. 5 (+) and the battery terminal (-). See the Figure.

Run the engine at idle.

The voltage measured must be 12 ... 14 V and must not be more than 1 V less than battery voltage.

Is the value for voltage O.K.?

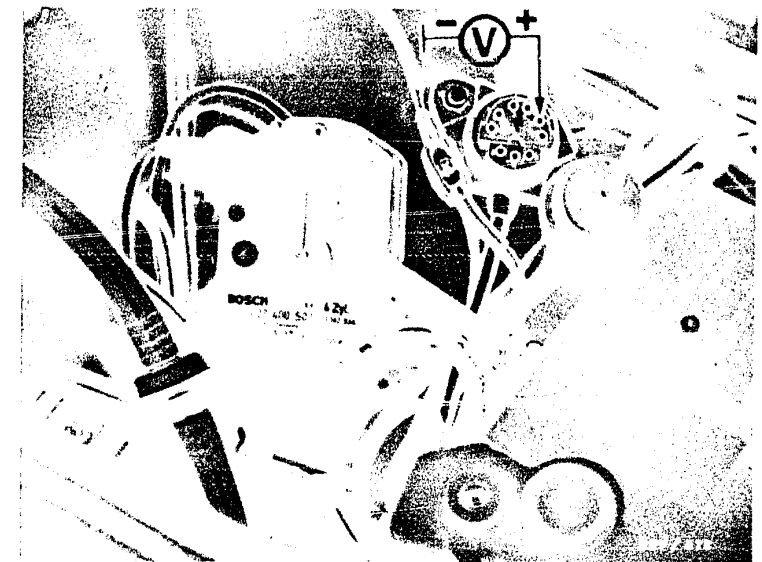
no

Disconnect the positive lead from the battery. Switch the ignition on. Check the leads from the positive battery terminal to the ignition coil Term. 15 for contact resistance.

Max. contact resistance 0.3  $\Omega$ .

(Take the resistance of the measuring lead and the test prods into consideration.)

Eliminate any contact resistance.



Diagnosis socket

yes

Continued on F7/F8

**F5**

Trouble-shooting program  
Mercedes-Benz



**F6**

Trouble-shooting program  
Mercedes-Benz



yes

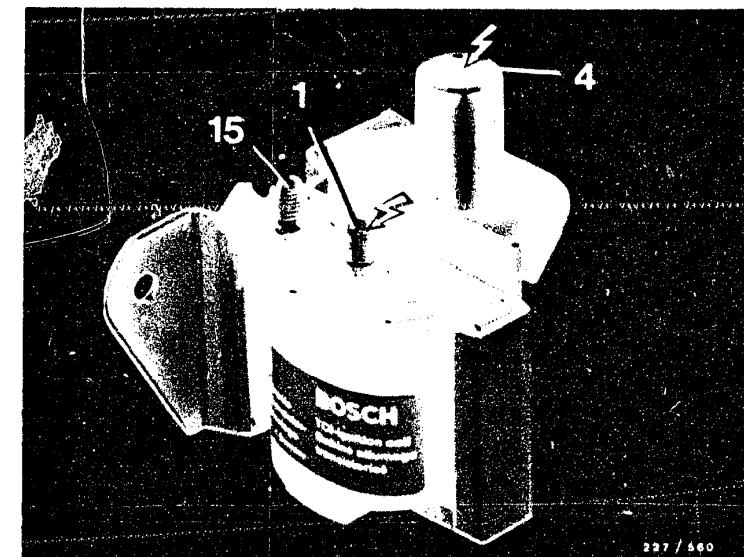
Check the peak coil current cutoff  
Connect a voltmeter to the ignition coil  
Term. 15 and Term. 1. Switch the ignition  
on. For approx. 1 sec. the voltmeter can  
move a short distance.  
The voltmeter must return to 0 V.  
Is the value for voltage (0 V) O.K.?

no

Take out and replace the electronic  
ignition control unit and the  
ignition coil.

yes

Continued on F9/F10



High voltage arrows:  
Warning, 400 V...25 kV!

**F7**

Trouble-shooting program  
Mercedes-Benz



**F8**

Trouble-shooting program  
Mercedes-Benz



yes

Check primary voltage.

(Where MOT series available). Connect oscilloscope (e.g. MOT 201) together with pulse shaper 1 684 463 154 per operating instructions to ignition coil.

Note:

Incorrect reading without pulse shaper.

Run engine at idle. Measured primary voltage should 280 ... 360 V. See illustration.

Voltage OK?

no

Replace EI control unit.

yes

If all test steps were OK, but customer complaint is not yet eliminated, try installing prescribed ignition coil.  
If customer complaint still not eliminated, re-install "old" ignition coil.

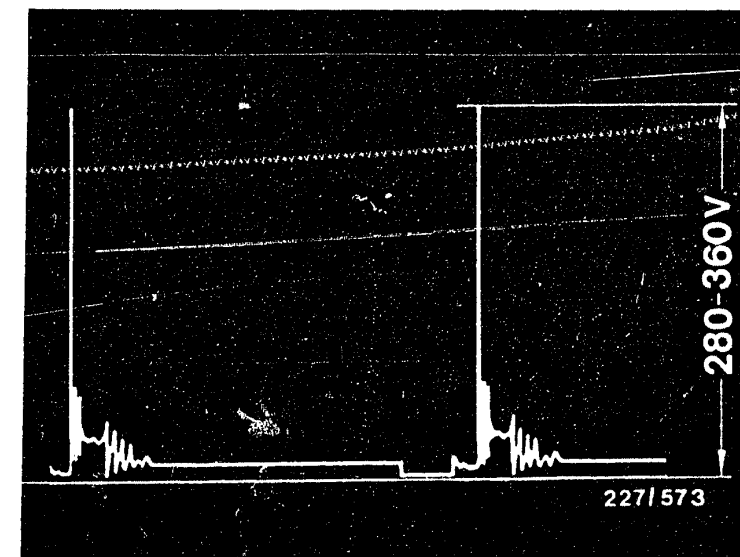
Ignition system OK.

Testing completed.

Testing as of F11 no longer necessary.

Note:

Further defects possible in fuel system, or engine mechanically out of order.



**F9**

Trouble-shooting program

Mercedes-Benz



**F10**

Trouble-shooting program

Mercedes-Benz





No primary voltage or no ignition spark.  
(Continuation from E9/E10)

yes

Check isolation of pulse generator.  
Disconnect EI control unit plug and connect  
ohmmeter to term. 7 and battery negative  
terminal. See upper illustration. Ohmmeter  
should show  $\infty\Omega$ .  
Is resistance OK?

no

If resistance is approx.  $0\Omega$ ,  
replace pulse generator.  
See lower illustration.

yes

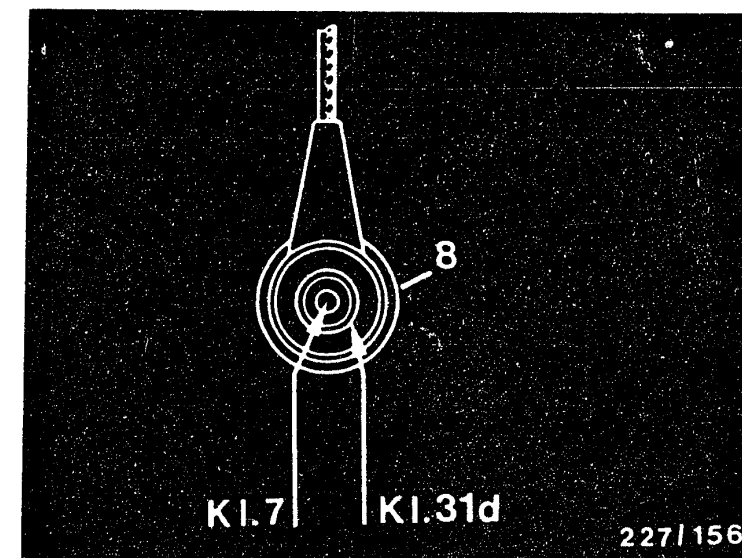
Check internal resistance of pulse generator.  
Connect ohmmeter to disconnected EI control  
unit plug term. 7 and term.31d.  
See upper illustration.  
Ohmmeter should show 680 ... 1200  $\Omega$ .  
Is resistance OK?

no

Replace pulse generator.  
See lower illustration

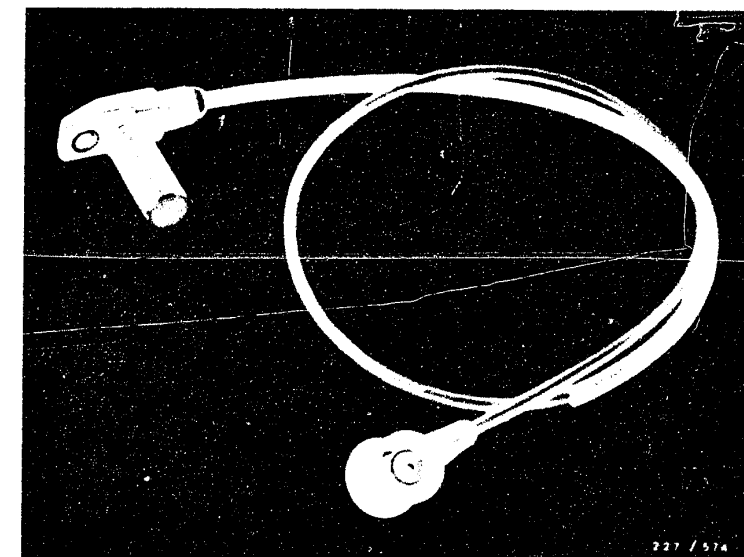
yes

Continued on F13/F14



8 = EI control unit plug - pulse  
generator

Pulse generator



**F11**

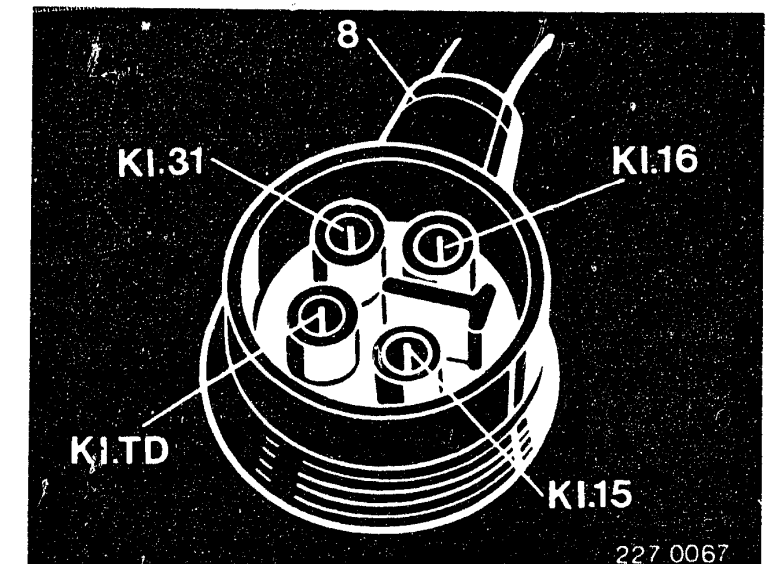
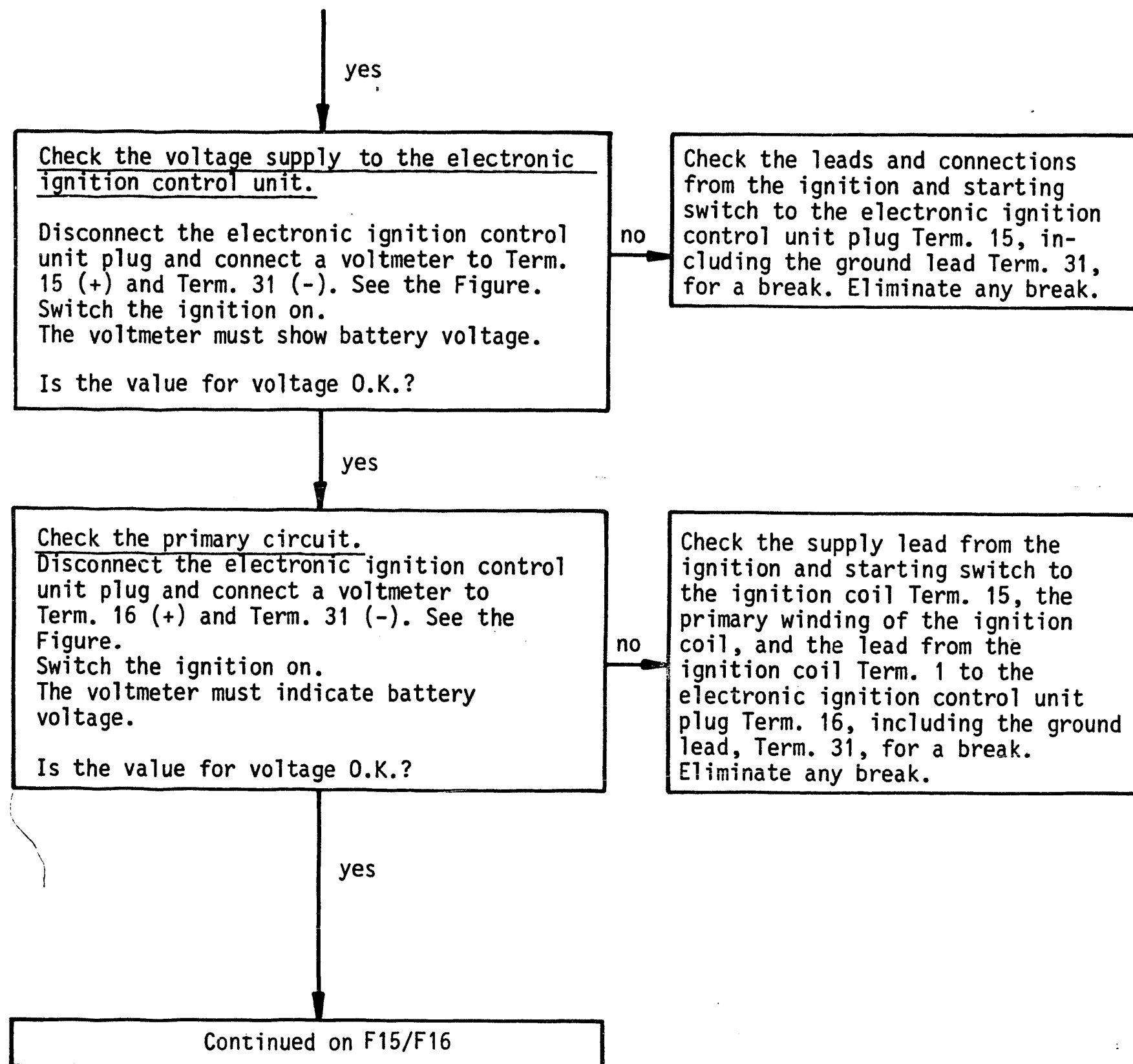
Trouble-shooting program  
Mercedes-Benz



**F12**

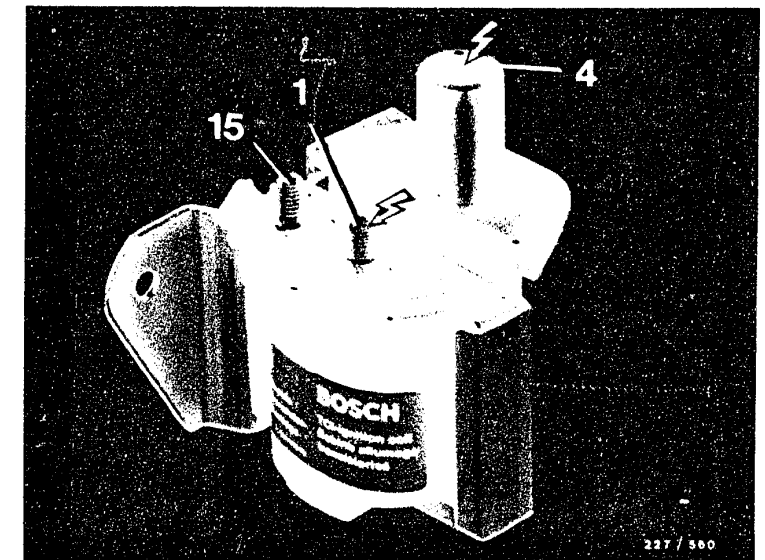
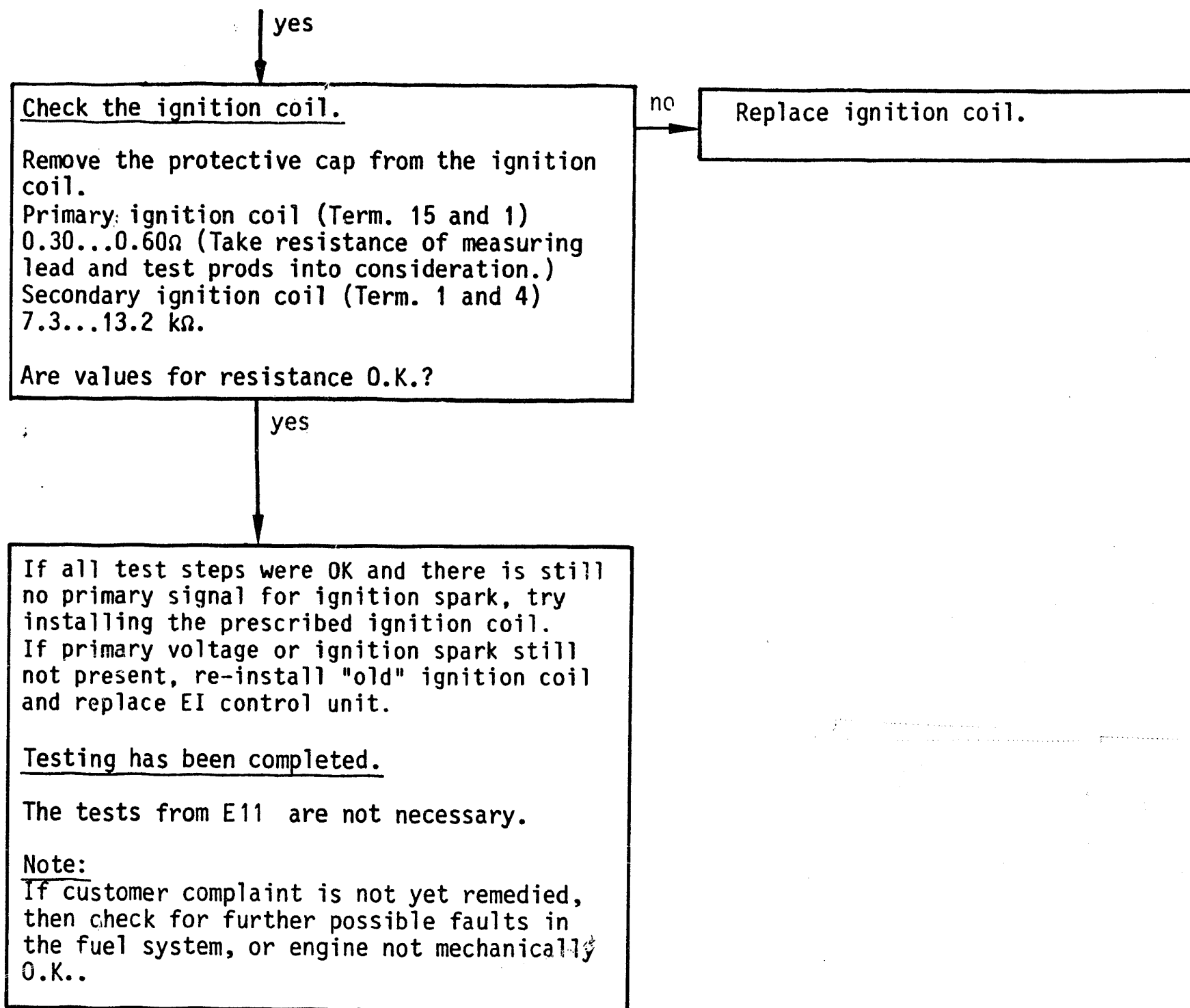
Trouble-shooting program  
Mercedes-Benz





8=Electronic ignition control unit plug  
KI.=Term.





High voltage arrows:  
 Warning, 400 V...25 kV!

**F15**

Trouble-shooting program  
 Mercedes-Benz

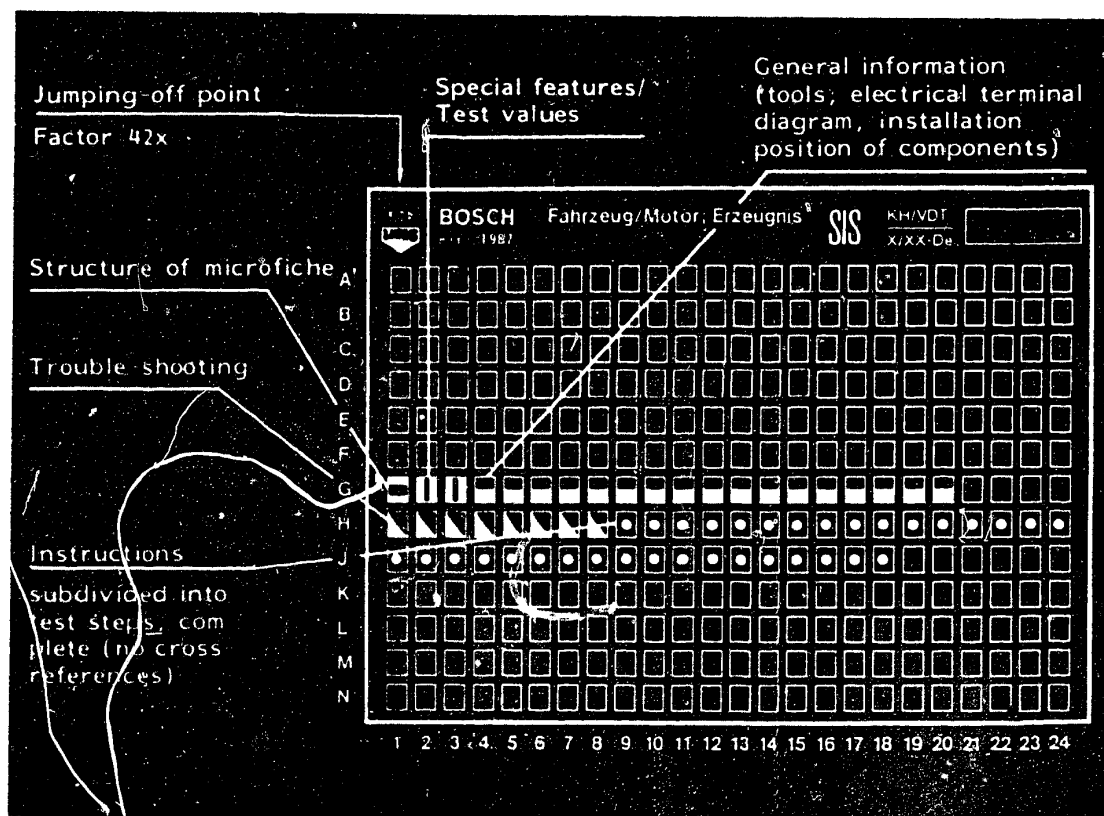


**F16**

Trouble-shooting program  
 Mercedes-Benz



## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

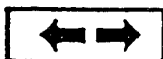
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



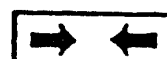
Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6



<b>G1</b>	Repair and testing	
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## 1. Special features

Mercedes-Benz 230 E engine M 102.982, 1985 date of manufacture Sweden/Switzerland version equipped with Siemens electronic-ignition control unit (with current limitation)

Daimler Benz service part

Ignition coil 0 221 5..

## 2. Test specifications

Primary ignition coil	0.3 ... 0.6 $\Omega$	<b>H11</b>
Secondary ignition coil	7.3 ... 13.2 k $\Omega$	

Coolant temperature sensor	+ 20°C	2.1 ... 2.9 k $\Omega$	<b>H19</b>
	+ 30°C	1.4 ... 2.0 k $\Omega$	
	+ 80°C	280 ... 370 $\Omega$	
	+ 90°C	210 ... 280 $\Omega$	
	+ 100°C	160 ... 215 $\Omega$	

Trimming plugetting position	1 =	$\infty$ $\Omega$	<b>H21</b>
	2 =	2.4 k $\Omega$	
	3 =	1.3 k $\Omega$	
	4 =	750 $\Omega$	
	5 =	470 $\Omega$	
	6 =	220 $\Omega$	
	7 =	0 $\Omega$	



Ignition timing without vacuum  
Engine 102.982 24...28° BTDC at 3200 min<sup>-1</sup>

**H17**  
↓  
**J3**

To prevent incorrect measurements,  
test must be performed as des-  
cribed on Coordinates given on  
right.

Electronic-ignition control 12 ... 14 V  
unit power supply max. 1 V  
and ignition coil with below V<sub>B</sub>  
engine idling

**J7**

Primary voltage 280 ... 360 V  
with engine idling

**J11**

Internal resistance of 680 ... 1200 Ω  
pulse generator  
Insulation, pulse generator ∞ Ω

**J13**

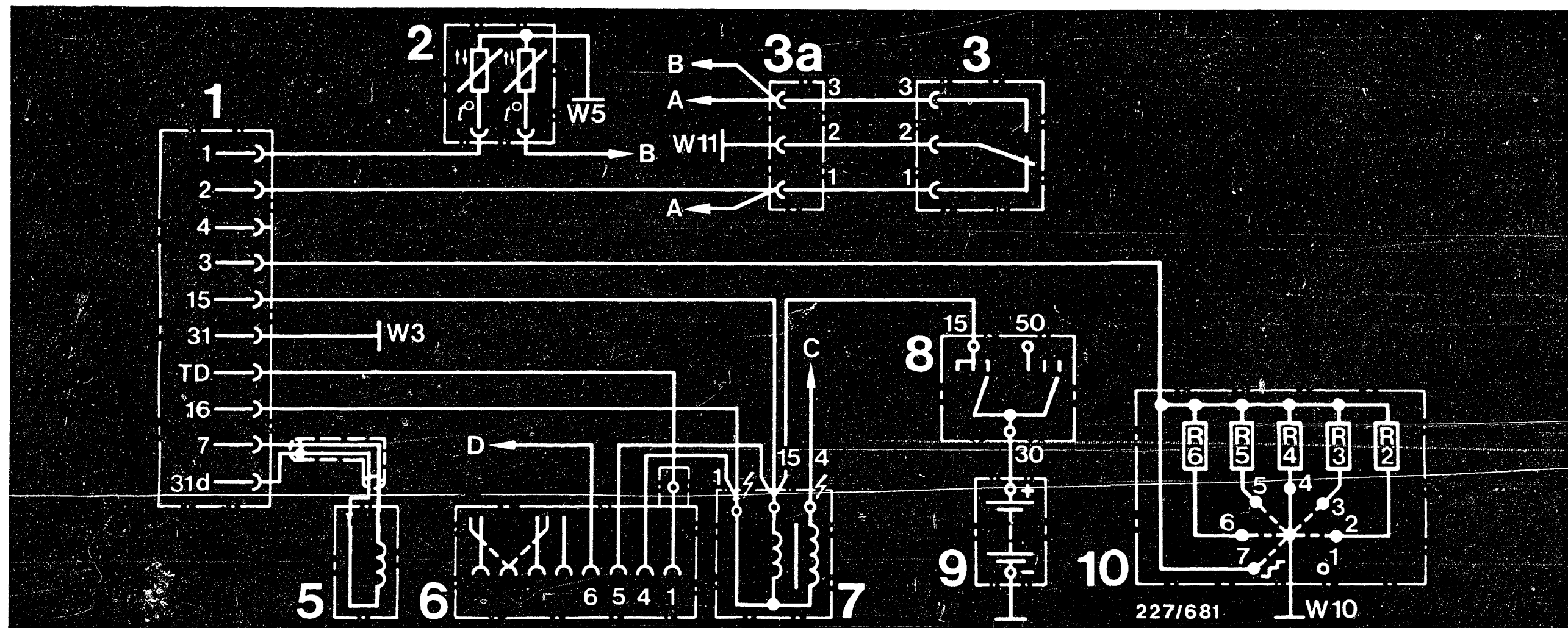
See Autodata test specifications for settings for  
idle speed, exhaust etc.

**G3**

Test specifications

Mercedes-Benz





Danger arrows:  
Warning: 400 V ... 25 kV

1 = Electronic-ignition control unit  
2 = Coolant temperature sensor (double NTC)  
3 = Throttle-valve switch  
3a = Throttle-valve switch plug connector

5 = Pulse generator  
6 = Diagnostic socket  
7 = Ignition coil  
8 = Ignition/starting switch  
9 = Battery  
10 = Trimming plug

A = to exhaust-gas recirculation control unit  
B = to KE-Jetronic control unit  
C = to high-voltage distributor  
D = Engine plug connector

W 3 = Ground, wheel housing front left (ignition coil)  
W 5 = Ground, engine  
W10 = Ground, battery  
W11 = Ground, engine (electric lead screwed on)

### 3. Electrical terminal diagram

**G4**

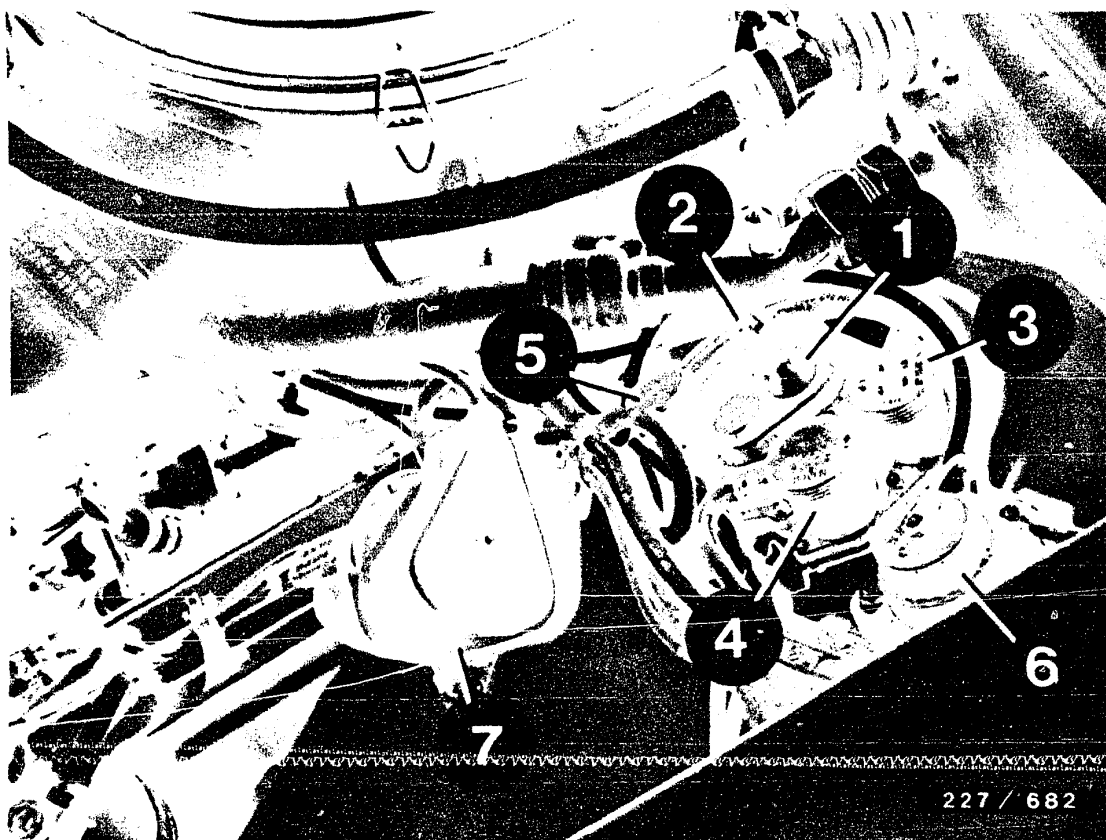
Electrical terminal diagram  
Mercedes Benz



**G5**

Electrical terminal diagram  
Mercedes Benz





227 / 682

- 1 = Electronic ignition control unit
- 2 = Vacuum hose
- 3 = Quadruple plug - power supply
- 4 = Quadruple plug - sensor
- 5 = Coaxial plug - pulse generator
- 7 = Plastic ignition coil with protective cover

#### 4. Installation position of components

Electronic-ignition control unit, diagnostic socket and ignition coil are situated on the wheel housing on the left-hand side as viewed in the forward direction of travel.

**G6**

Installation position of the components  
Mercedes Benz







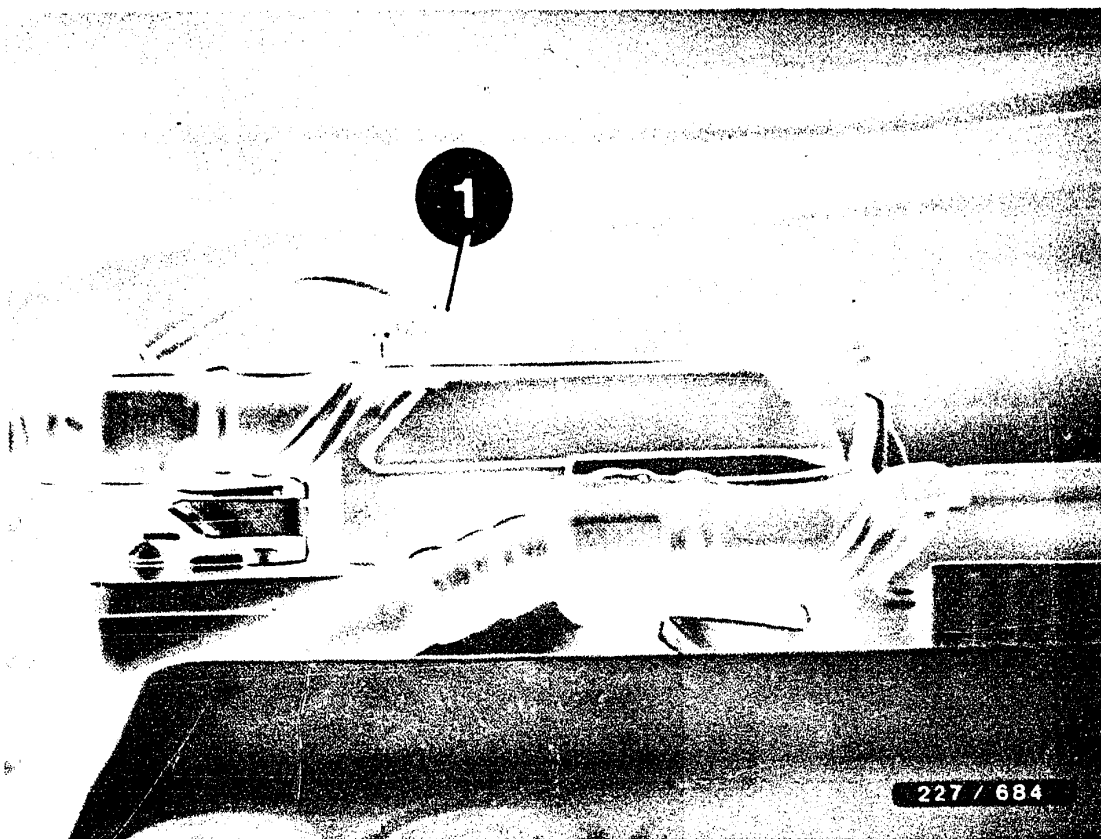
Arrow = Pulse generator

The pulse generator is located on the engine block on the left, looking in the direction of forward vehicle travel (below the oil filter).

**G7**

Installation position of components  
Mercedes Benz

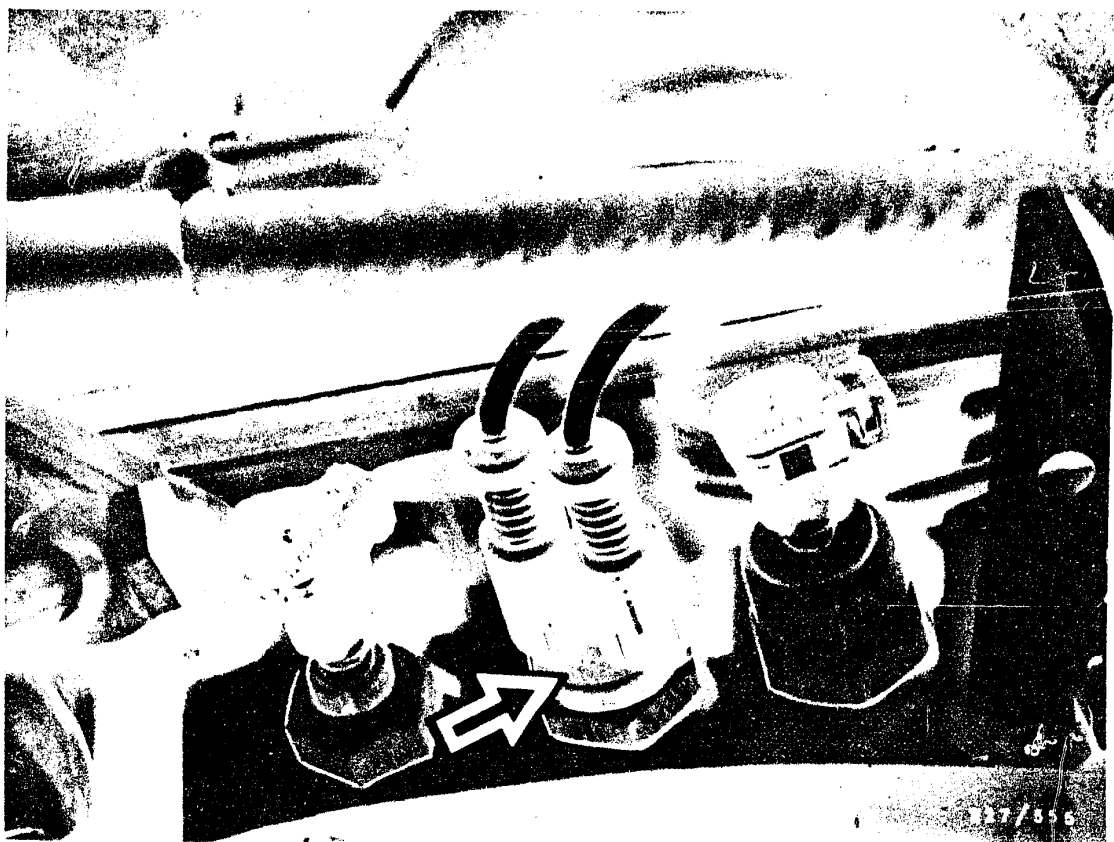




1 = Ignition trimming plug

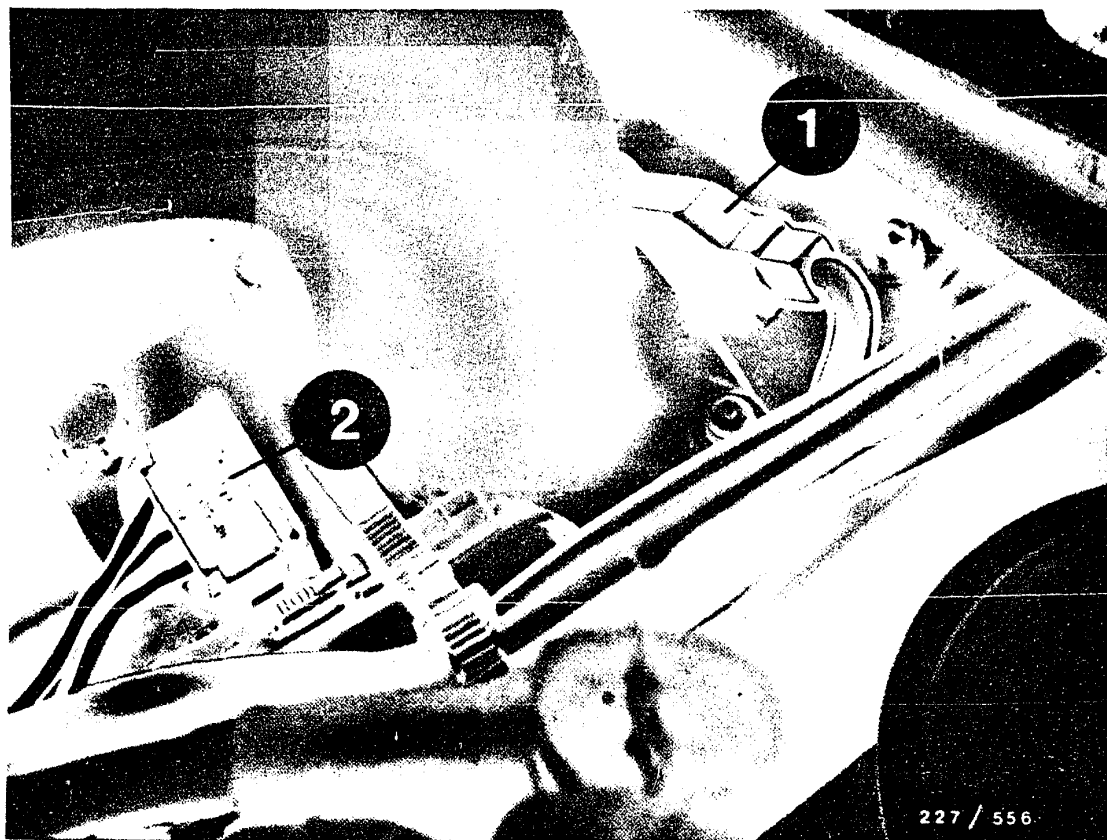
Trimming plug is situated in the equipment space behind the battery.





Arrow = Coolant temperature sensor (double NTC)

The coolant temperature sensor is located at the front on the cylinder head (thermostat housing).



1 = Throttle-valve switch

2 = Plug connection from the throttle valve switch

The throttle-valve switch is located on the throttle-valve assembly.

**G 10**

Installation position of the components  
Mercedes Benz



## 5. Necessary test equipment and aids

Motortester e.g.	MOT 201	0 684 000 201
Pulse shaper (required for measuring the primary voltage with MOT 201, 202, 206 and 400)		1 684 463 154
Adapter lead for the diagnosis socket		1 684 463 094
Spark gap e. g. ignition coil and condenser tester	EFAW 106 A	0 681 100 001
or single spark gap	EF 1177/7	1 684 531 000
5 k $\Omega$ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontava Wh2	commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Thermal conduction paste		5 942 860 003
Test prods (for proper connection of test instruments to connection plugs)		commercially available



## 6. Danger of accident. on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

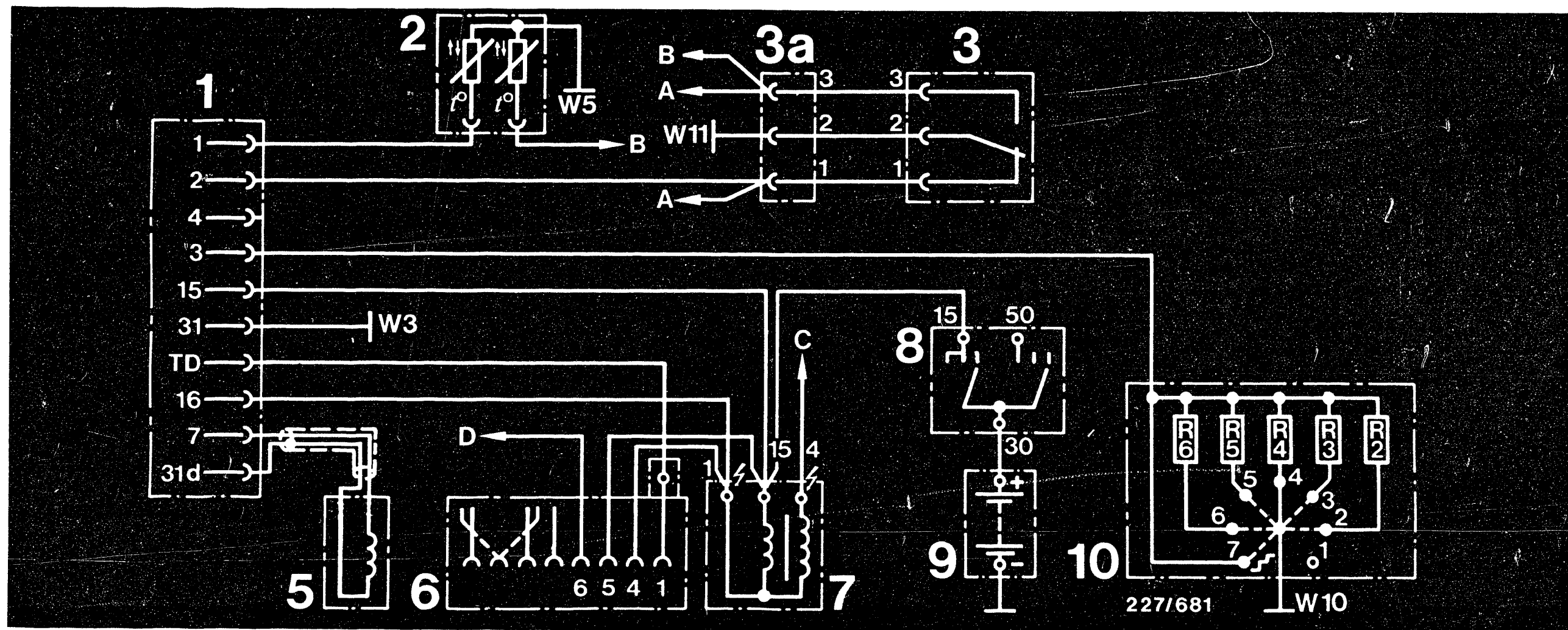
The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment. (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. KE-Jetronic), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.





Danger arrows:  
Warning: 400 V ... 25 kV

1 = Electronic-ignition control unit  
2 = Coolant temperature sensor  
(double NTC)  
3 = Throttle-valve switch  
3a = Throttle-valve switch  
plug connector

5 = Pulse generator  
6 = Diagnostic socket  
7 = Ignition coil  
8 = Ignition/starting switch  
9 = Battery  
10 = Trimming plug

A = to exhaust-gas recir-  
culation control unit  
B = to KE-Jetronic control  
unit  
C = to high-voltage  
distributor  
D = Engine plug connector

W 3 = Ground, wheel  
housing front left  
(ignition coil)  
W 5 = Ground, engine  
W10 = Ground, battery  
W11 = Ground, engine  
(electric lead  
screwed on)

#### Electrical connection diagram

The hazard locations are identified with high voltage arrows using, as an example, the connection diagram for an electronic ignition system.

**G 13**

Accident hazard  
Mercedes Benz



**G 14**

Accident hazard  
Mercedes Benz



7. Incorrect indication of engine speed, dwell angle  
and ignition point

In the case of Siemens (electronic-ignition) ignition systems with current limitation, there may be an incorrect reading of engine speed, dwell angle and ignition timing on test equipment.

For further details see coordinates N 7 - N 11.

**G 15**

Incorrect reading of test equipment

Mercedes Benz





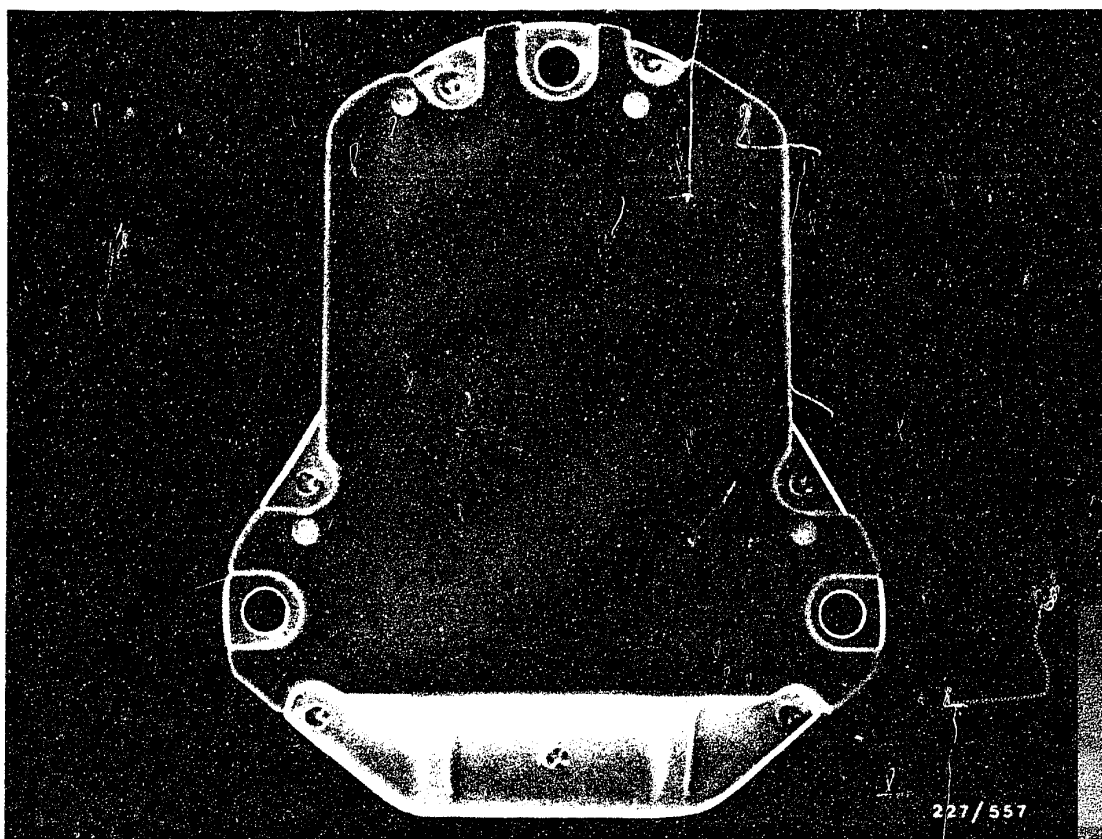
## 8. Important vehicle information

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- For a compression test, disconnect the coaxial plug (pulse generator) from the electronic ignition control unit.
- Never disconnect the battery while the engine is running.
- A starting assist with more 16 Volts or with a quick-charger is not permitted.
- The specified ignition coil (see Part.No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (the electronic ignition control unit is destroyed).
- The ignition lead from the ignition coil Term. 4 to the high voltage distributor Term. 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15.  
The electronic ignition control unit can be destroyed.



- If the poles are reversed on the ignition coil (Term. 1 and Term. 15) there are severe losses of ignition energy, causing missing. In addition, the electronic ignition control unit is overloaded. In order to preclude reversal of poles, the terminal studs have different diameters. (M5 and M6)
- In order to avoid destruction of the electronic ignition control unit, the secondary end of the ignition system must have interference suppression of min. 2 k $\Omega$ . The original distributor rotor must be installed with an interference suppression resistor of 1 k $\Omega$ . (Do not use a 5 k $\Omega$  distributor rotor for radio and interference suppression either.)
- If the poles on the battery are incorrectly connected, the electronic ignition control unit and the ignition coil are destroyed.



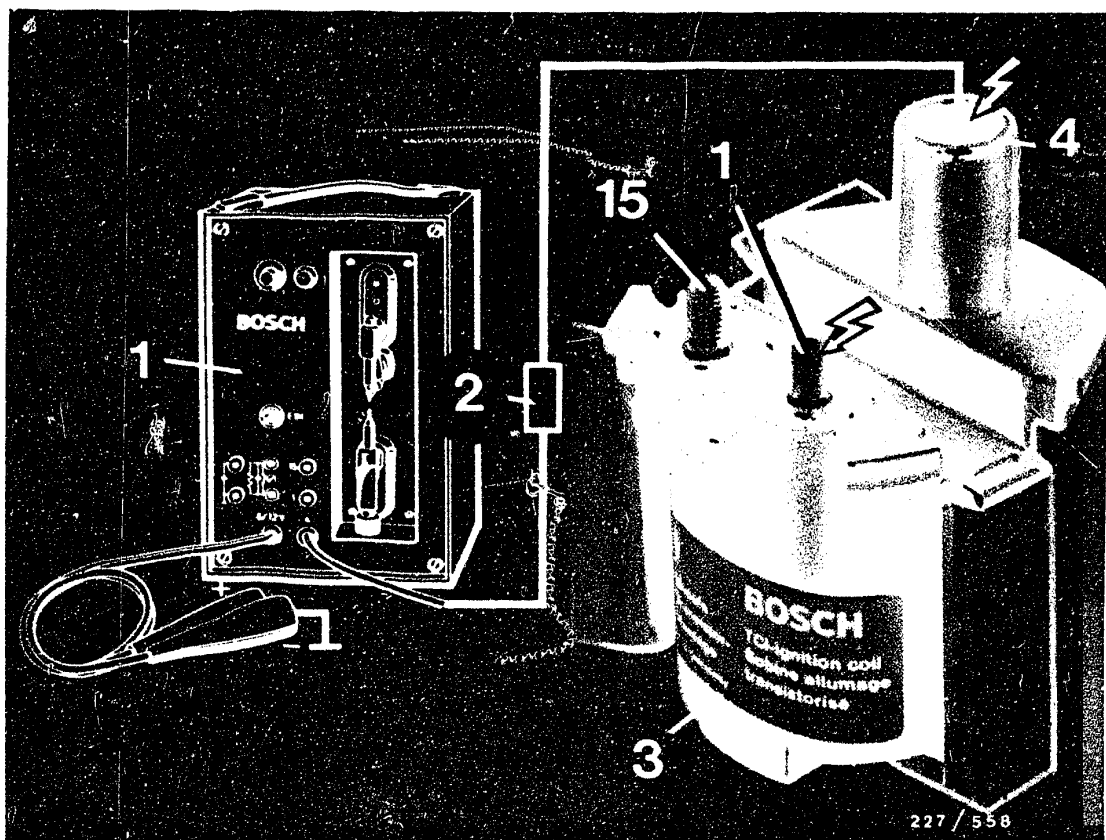


- Before putting on the electronic ignition control unit, the base plate (see the Figure, bright surface) must be coated with a heat conduction paste.

Apply thermal conduction paste only with a suitable object (screwdriver, etc.).

Do not apply thermal conduction paste to painted parts.





High voltage arrows:

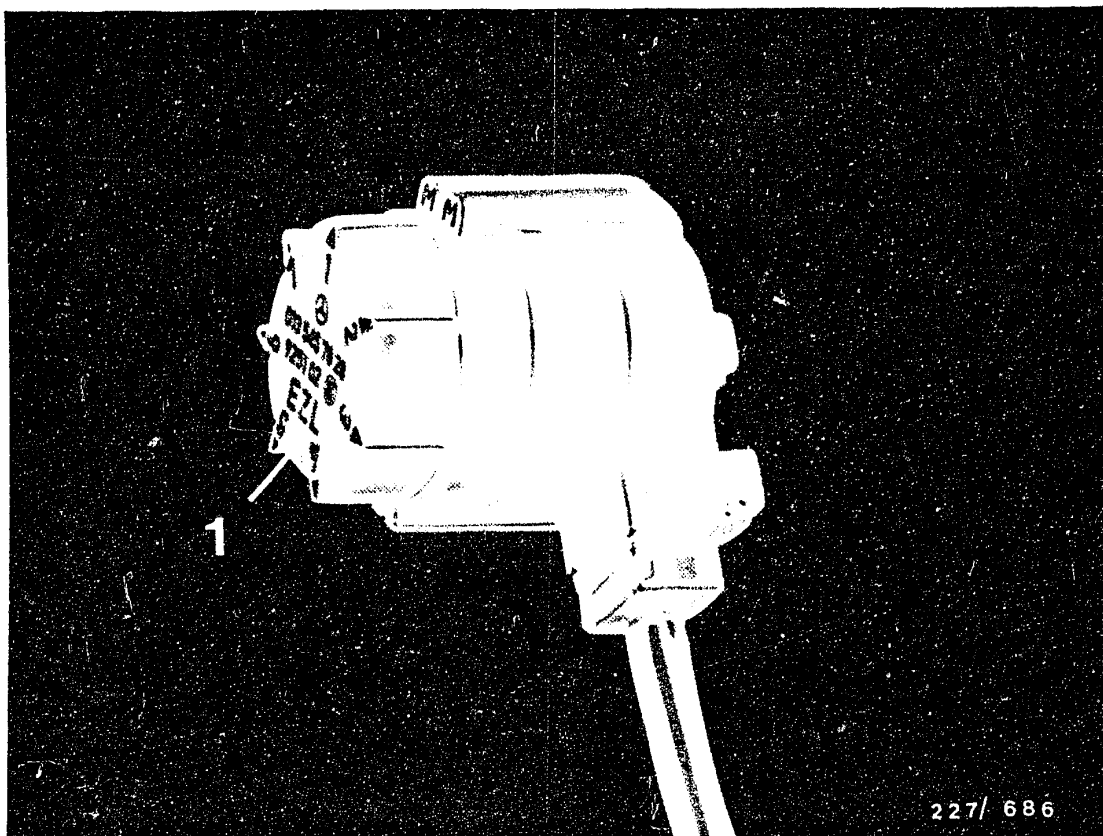
Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 k sleeve-type suppressor

3 = Ignition coil

- When using a spark gap - in order to prevent irreparable damage to the electronic-ignition control unit - an interference-suppression resistor of at least 2 k must be connected between the spark gap and ignition coil terminal 4, e.g. sleeve-type suppressor (5 k ) 0 356 500 001.



1 = Trimming plug complete with lead

- If using premium fuel of low octane number, the engine may knock. To prevent any engine damage, the ignition timing can be retarded with the aid of the trimming plug.

Procedure: Pull out trimming plug as far as it will go, make adjustment and push on again. See picture. Each position of the trimming plug retards the ignition timing by approx. 2° crankshaft.

When fuel of the prescribed octane number is again available, return the trimming plug to position "1".



## 9. Trouble-shooting

### 9.1 How to use the trouble-shooting chart

The trouble-shooting chart starting on Coordinate H 3 contains customer complaint (fault symptom), cause of trouble, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate H 9.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.

If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

### 9.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate H 9 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 9.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

**H1**

Trouble-shooting  
Mercedes Benz



**H2**

Trouble-shooting  
Mercedes Benz



## 9.4 Trouble-shooting chart

### Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinates

●	●	●	●	●	●	●	●	●	Unclear	Perform detailed trouble-shooting	H 9
●	●	●	●	●	●		●		Spark plugs defective	Assessment by means of ignition oscilloscope or visual examination of spark plug when removed	----
●	●	●	●	●					Shunt on secondary side	Evaluation of the ignition coil, high voltage distributor, ignition harness, and spark plug by means of the ignition oscillogram or a visual inspection	----
●	●	●	●	●					Open circuit on secondary side	Assessment of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope, or continuity test with ohmmeter	----
●									Open circuit on primary side	--	J 15
●	●	●	●	●					Ignition coil defective	-	H 11
		●	●	●	●				Interference-suppression resistors defective	Assessment by means of ignition oscilloscope or resistance measurement	----

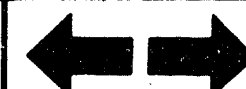
H3

Trouble-shooting chart  
Mercedes-Benz



H4

Trouble-shooting chart  
Mercedes-Benz



# Trouble-shooting chart (continued)

## Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinates

●							●	Incorrect firing sequence	1-3-4-2	---
●								Contact resistance/electronic-ignition control unit defective	---	H 15
●		●		●			●	Incorrect setting of high voltage distributor	---	H 13
			●		●	●	●	Pressure sensor not O.K.	---	H 17
			●		●			Coolant temperatur sensor not O.K.	---	H 19
			●		●	●		Incorrect timing angle	To prevent incorrect measurements, test <u>must</u> be performed as described on Coordinates given on right.	H 17...J 3
			●		●	●	●	Throttle-valve switch (idle contact) not O.K.		J 5

**H5**

Trouble-shooting chart  
Mercedes Benz



**H6**

Trouble-shooting chart  
Mercedes Benz

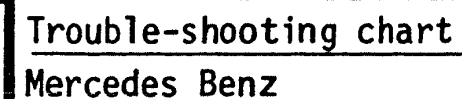




Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start
2. Rough idling
3. Poor throttle response (flat spot during acceleration)
4. Insufficient engine power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine overheats

									<u>Cause of trouble</u>	<u>Test instructions</u>	<u>Coordinates</u>
				●					Electronic ignition control unit not O.K.	---	J 11
●									Pulse generator not O.K.	---	J 13
●									Voltage supply to electronic ignition control unit not O.K.	---	J 15



## 9.5 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Remove the protective cap from the ignition coil.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

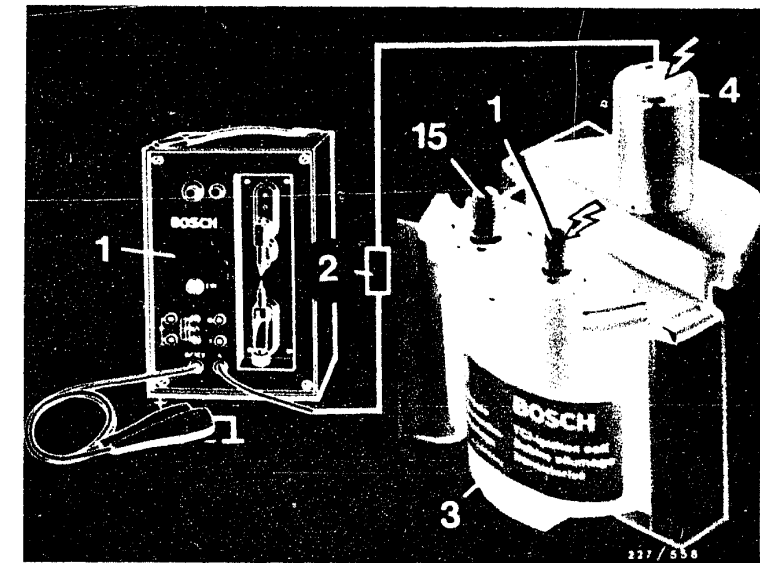
Primary signal present or ignition sparks across spark gap?

yes

Continued on H11/H12

If no primary signal or no ignition spark, continue testing at J13.

Tests from H11 onwards not necessary.



High voltage arrows:

Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 k $\Omega$  sleeve-type suppressor

3 = ignition coil

H9

Trouble-shooting program

Mercedes Benz

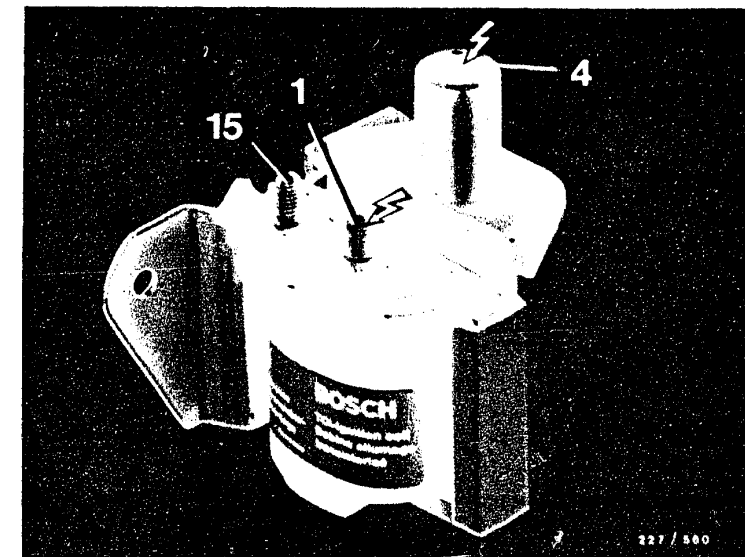
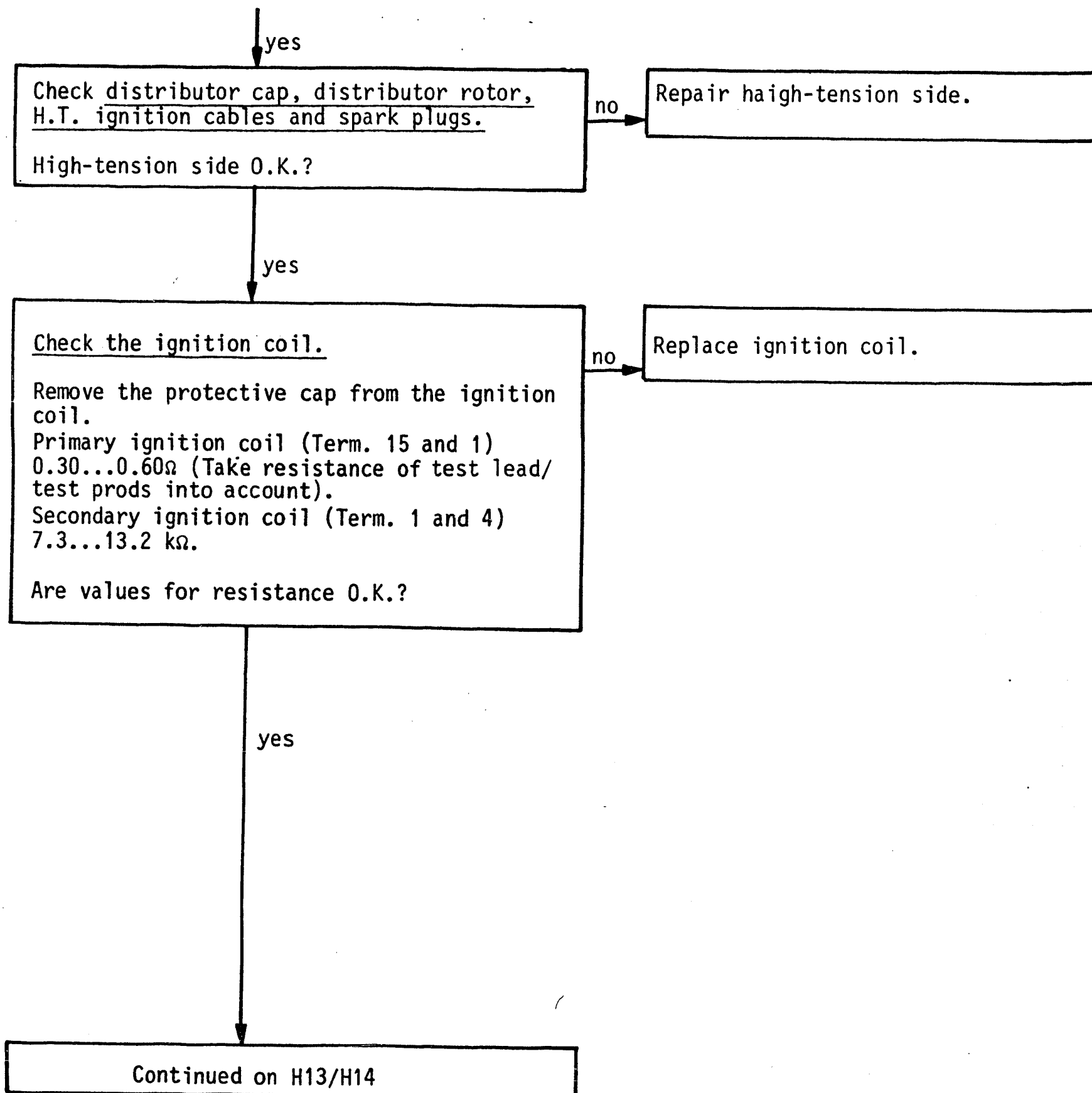


H10

Trouble-shooting program

Mercedes Benz





High voltage arrows:  
Warning, 400 V ... 25 kV!

**H11**

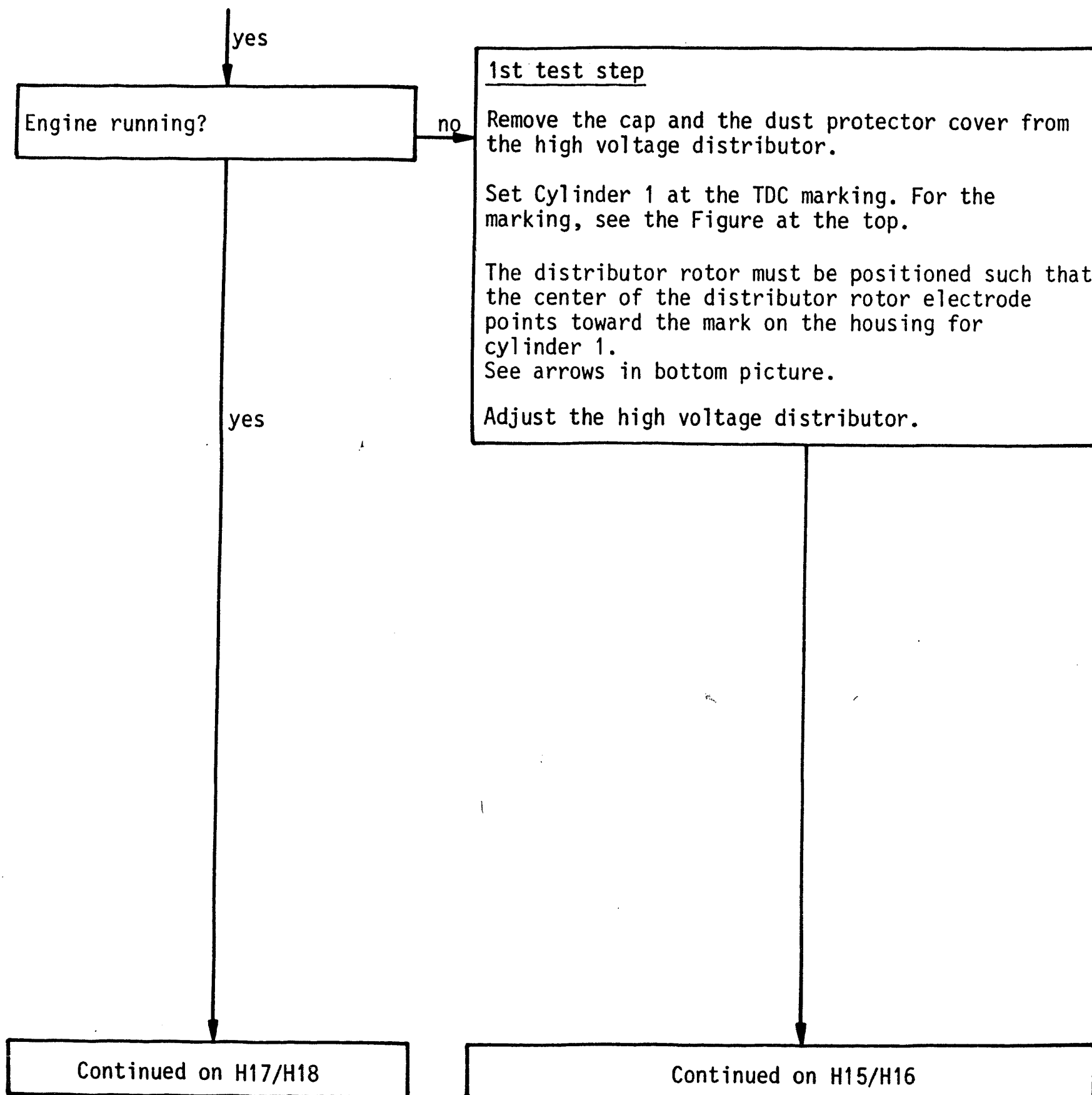
Trouble-shooting program  
Mercedes Benz



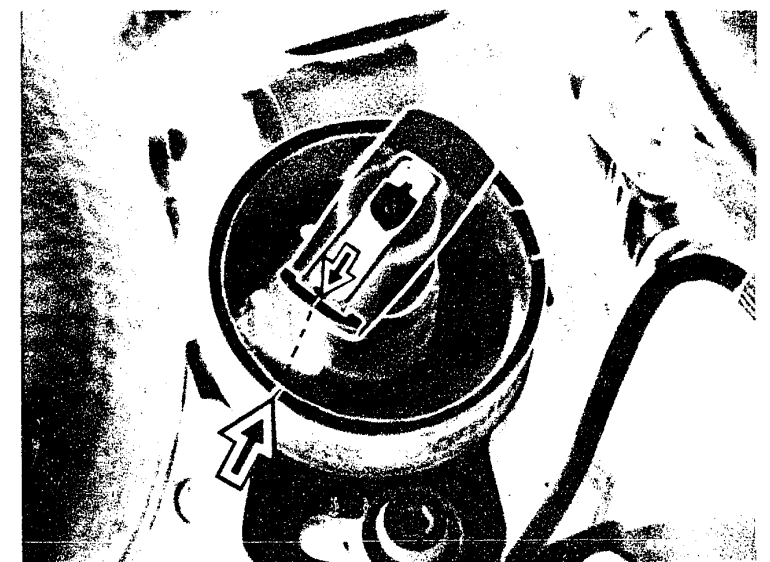
**H12**

Trouble-shooting program  
Mercedes Benz





Arrow=TDC marking



**H13**

Trouble-shooting program  
Mercedes Benz



**H14**

Trouble-shooting program  
Mercedes Benz



continued

2nd test step

Disconnect the negative and positive leads from the battery.

Disconnect the electronic ignition control unit plug. Switch the ignition on.

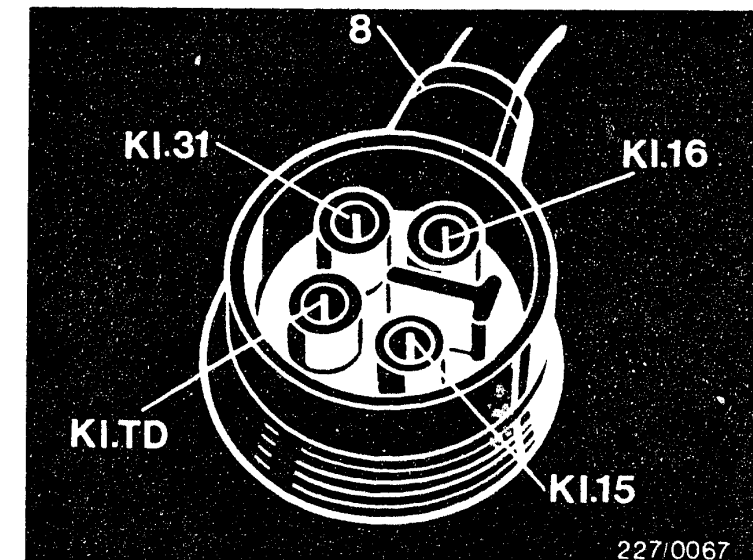
1. Check the leads from the positive battery terminal to the electronic ignition control unit plug Term. 15 and the leads from the negative battery terminal to the electronic ignition control unit plug Term. 31 for contact resistances. Max. total contact resistance 0.3Ω. (Take resistance of test lead into consideration). Eliminate contact resistances.

2. Check the leads from the positive battery terminal to the ignition coil Term. 15 and the lead from the ignition coil Term. 1 to the electronic ignition control unit plug Term. 16 for contact resistance. Max. total contact resistance 0.3 Ω. (Take the resistance of the test lead into consideration). Eliminate any contact resistance.

If the 1st and 2nd test steps are O.K., then take out and replace the electronic ignition control unit.

yes

Continued on H17/H18



8=Electronic ignition control unit plug

**H15**

Trouble-shooting program  
Mercedes Benz



**H16**

Trouble-shooting program  
Mercedes Benz



yes

Check the pressure sensor

Connect the motortester to the diagnosis socket using an adapter cable. Disconnect the vacuum hose from the electronic ignition control unit. See the Figure at the top.

Take the plug connection from the throttle valve switch apart. See the Figure at the bottom. Run the engine at idle.

Take reading for timing angle.

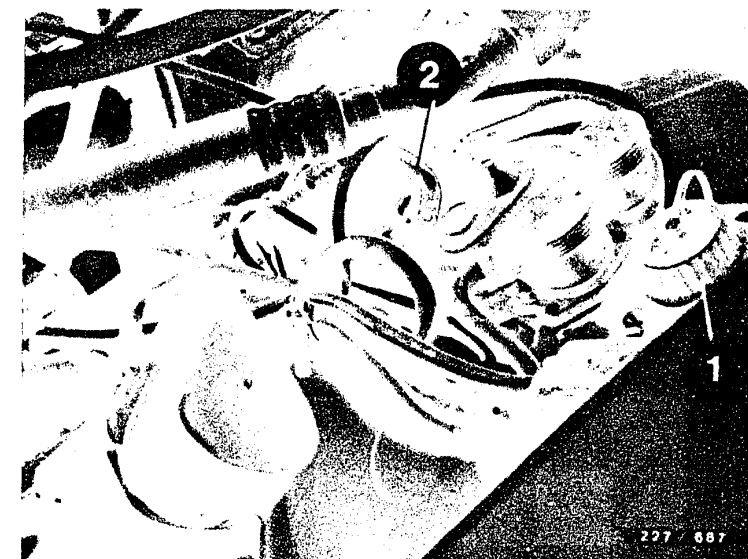
Put the vacuum hose back on the electronic ignition control unit. When this is done, the timing angle must change noticeably (in the direction "advance").

Did the timing angle change?

no

1. Check the vacuum hose from the electronic ignition control unit to the intake manifold plug connection for leaks. Eliminate any leaks.

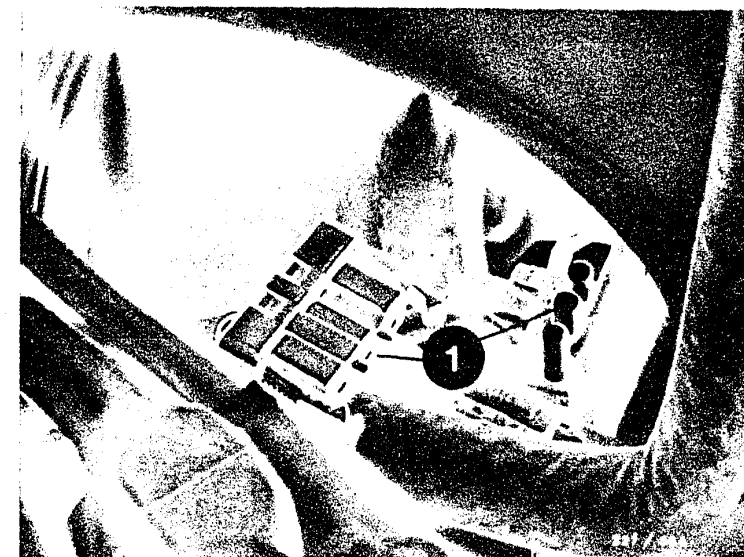
2. If there was no leak, take out and replace the electronic ignition control unit.



1=Diagnosis socket  
2=Vacuum hose

yes

1=Plug connection from the throttle valve switch



Continued on H19/H20

**H17**

Trouble-shooting program  
Mercedes Benz



**H18**

Trouble-shooting program  
Mercedes Benz



yes

Check the coolant temperature sensor.

Warm the engine up to normal operating temperature.  
Connect the motortester to the diagnosis socket using an adapter lead.  
Disconnect vacuum hose from electronic-ignition control unit (not shown).  
Take apart throttle-valve switch plug connector (top picture Item 1).  
Run the engine at 3200 min<sup>-1</sup>. Take reading for timing angle.  
Disconnect the coolant temperature sensor plug (color of cable green/black).  
See arrow in center picture).  
When this is done, the timing angle must change.

Did the timing angle change?

yes

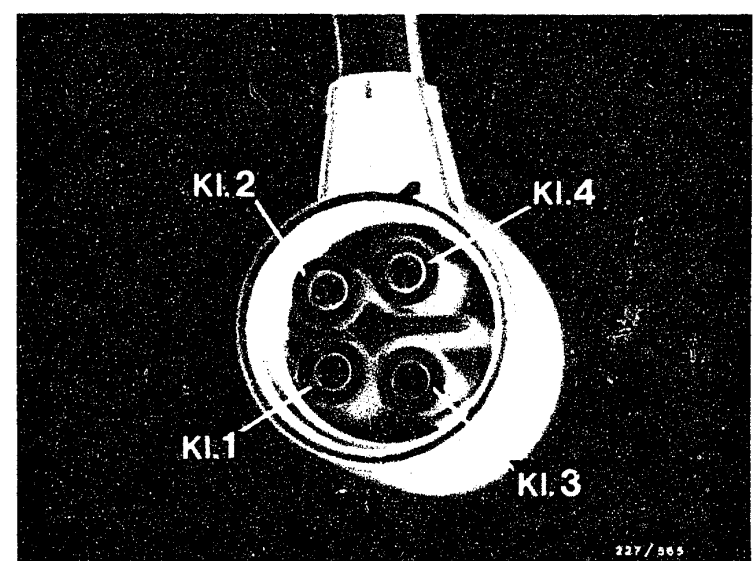
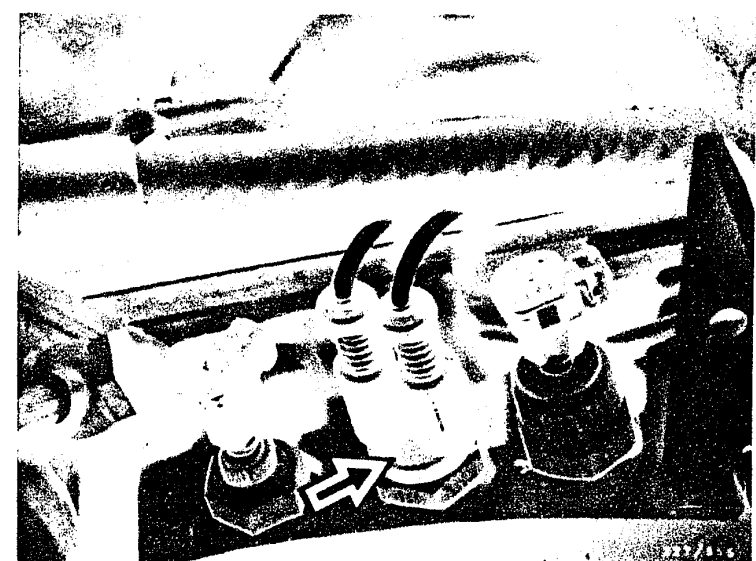
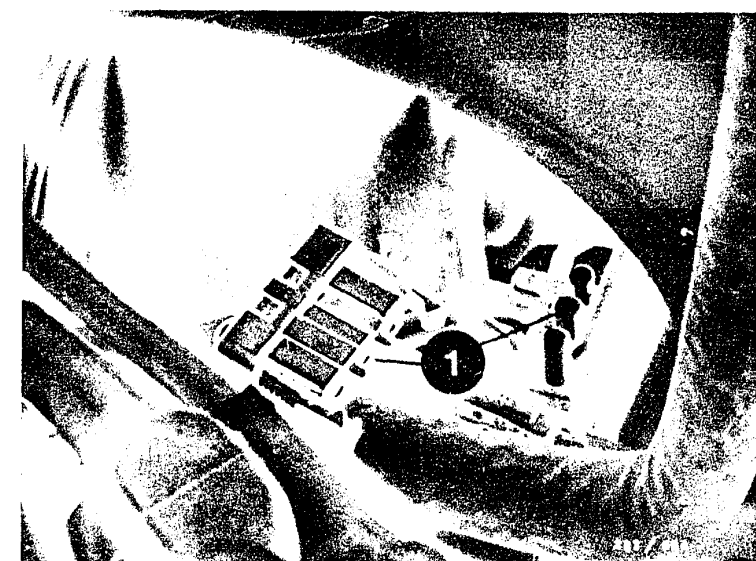
Continued on H21/H22

no

Switch the ignition off.  
Disconnect the electronic ignition control plug and connect an ohmmeter to Term. 1 (see figure at bottom) and vehicle ground.  
For resistances, see the table.

Coolant temperature		Resistance
+ 20°C	=	2.1...2.9 kΩ
+ 30°C	=	1.4...2.0 kΩ
+ 80°C	=	280...370 Ω
+ 90°C	=	210...280 Ω
+100°C	=	160...215 Ω

If the ohmmeter reads ∞Ω, then check the lead from the coolant temperature sensor plug (color of cable green/black) to the electronic ignition control unit plug Term. 1 for continuity. Eliminate any break. If the values for resistance deviate, take out and replace the coolant temperature sensor.



Yes

Check trimming plug.

Engine at normal operating temperature.

Connect motortester to diagnostic socket with adapter lead. See top picture.

Disconnect vacuum hose from electronic-ignition control unit. See top picture.

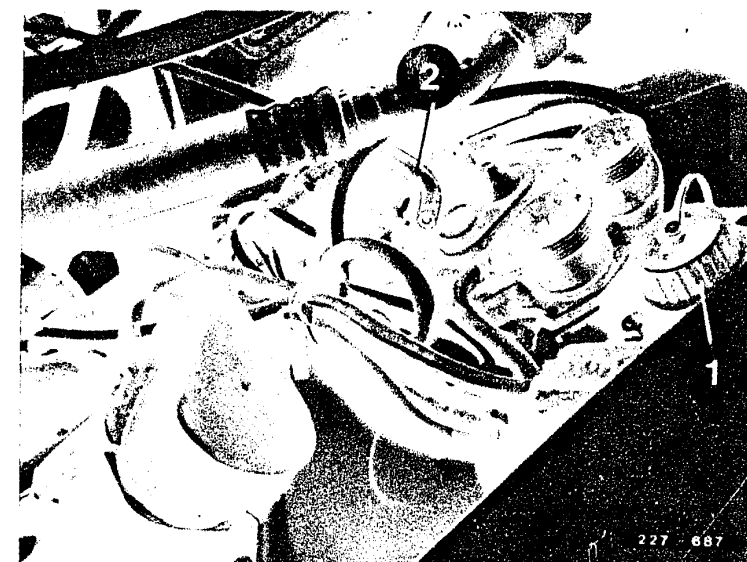
See top picture.

Disconnect plug connector from throttle-valve switch. See bottom picture.

See bottom picture.

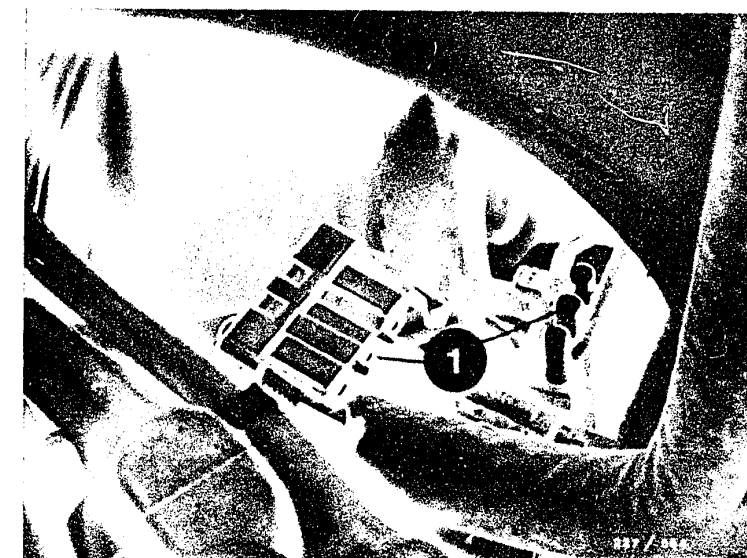
Yes

Continued on H23/H24



1 = Diagnostic socket  
2 = Vacuum hose

1 = Throttle-valve switch plug connector



H21

Trouble-shooting program

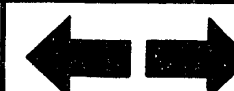
Mercedes Benz



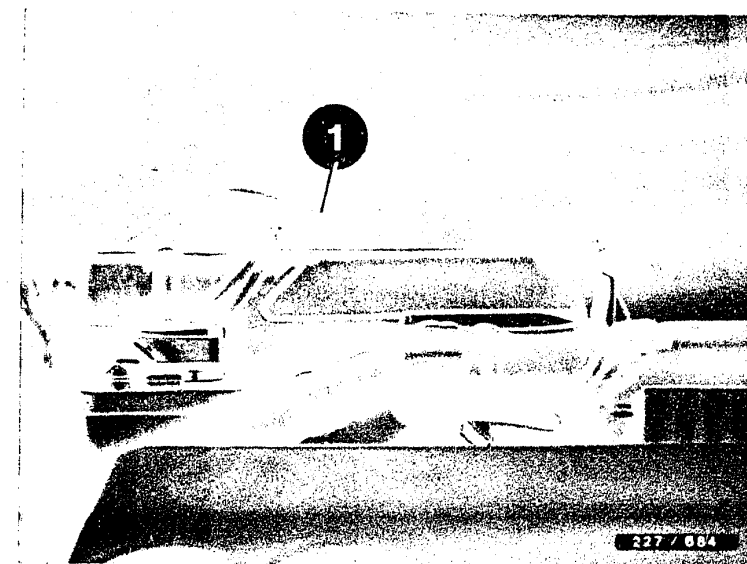
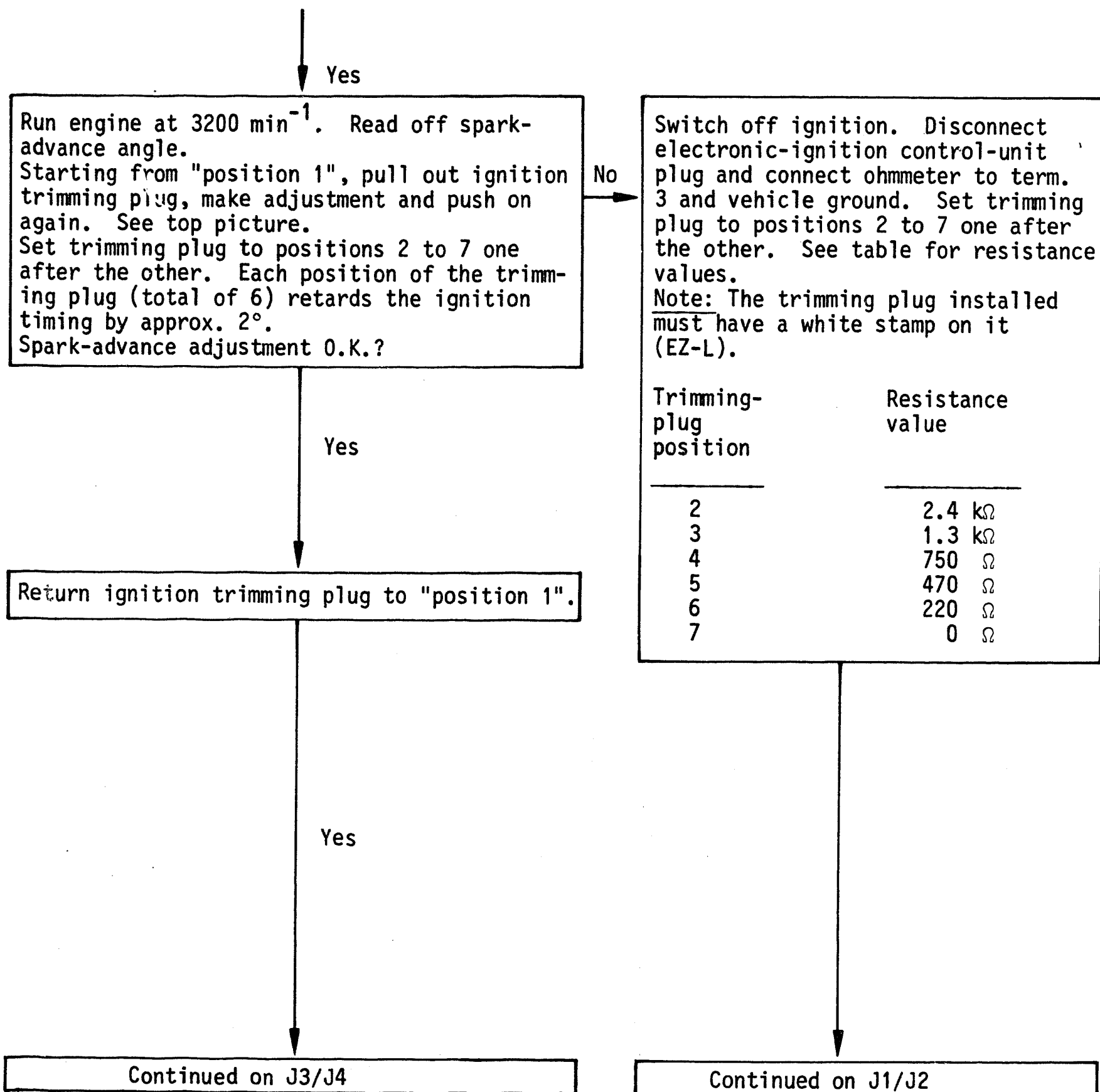
H22

Trouble-shooting program

Mercedes Benz

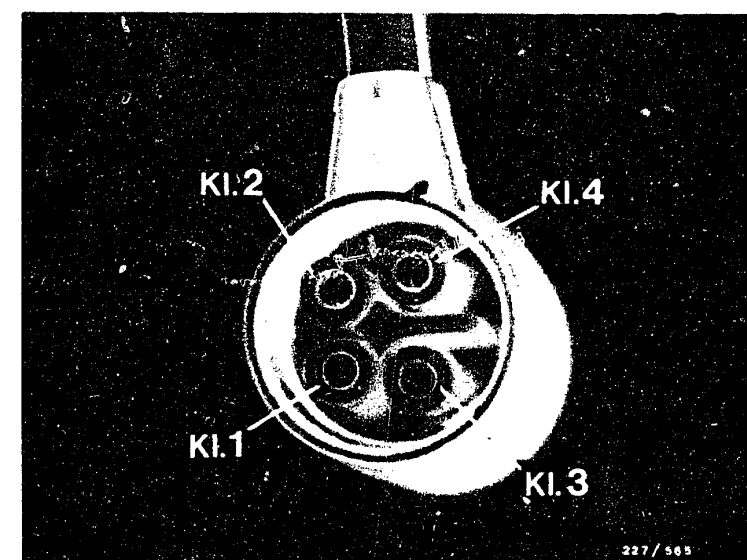






1 = Ignition trimming plug

Electronic-ignition control-unit plug



H23

Trouble-shooting program

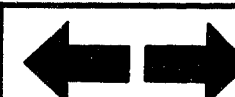
Mercedes Benz



H24

Trouble-shooting program

Mercedes Benz

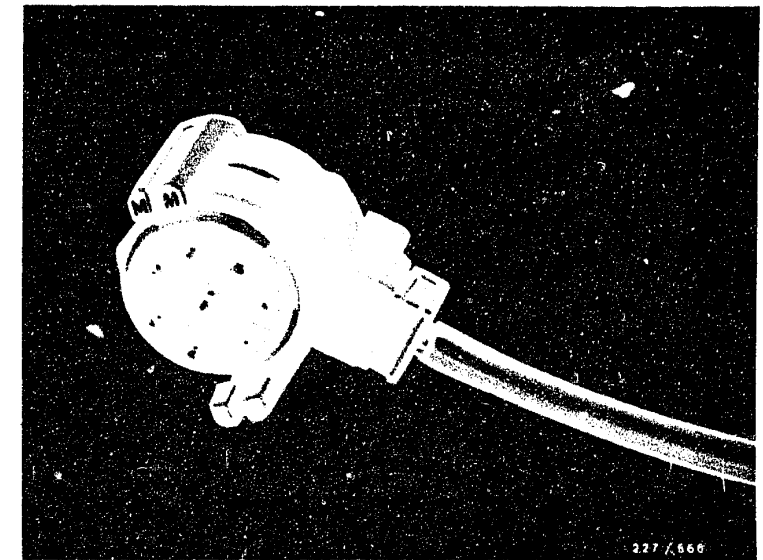


Continued

If resistance was O.K. in all 6 trimming-plug positions, replace electronic-ignition control unit.

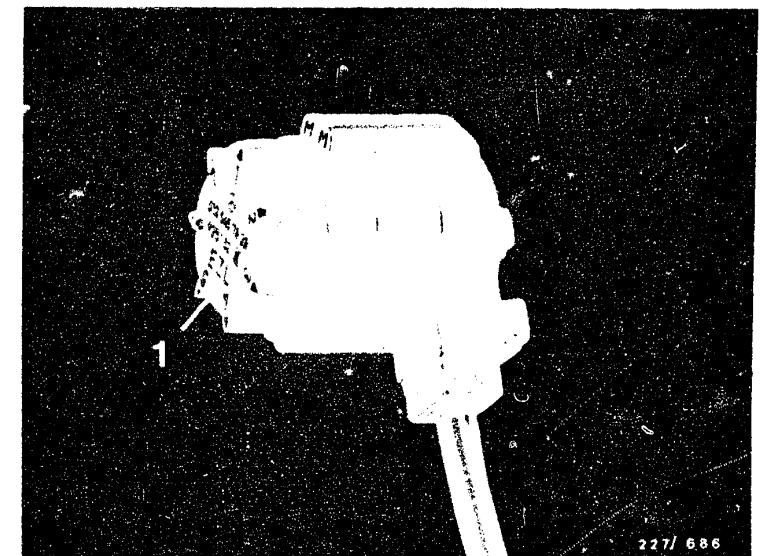
If resistance was approx.  $0\ \Omega$  or  $\infty\ \Omega$  in all 6 trimming-plug positions, replace trimming-plug housing without trimming plug. See top picture.

If resistance was not within tolerance, replace trimming plug. See bottom picture.



Trimming-plug housing

1 = Trimming plug



\*Yes

Continued on J3/J4

J1

Trouble-shooting program  
Mercedes Benz



J2

Trouble-shooting program  
Mercedes Benz



Yes

Check ignition timing.  
Engine at normal operating temperature.  
Motortester connected to diagnostic socket  
with adapter lead.  
Vacuum hose disconnected from electronic-  
ignition control unit.  
See top picture.  
Throttle-valve switch plug connector dis-  
connected.  
See bottom picture.

Ignition timing should be:  
Engine M 102.982 with Siemens electronic-  
ignition control unit 24...28° BTDC at  
3200 min<sup>-1</sup>.

Ignition timing O.K.?

No

Replace electronic-ignition control  
unit.

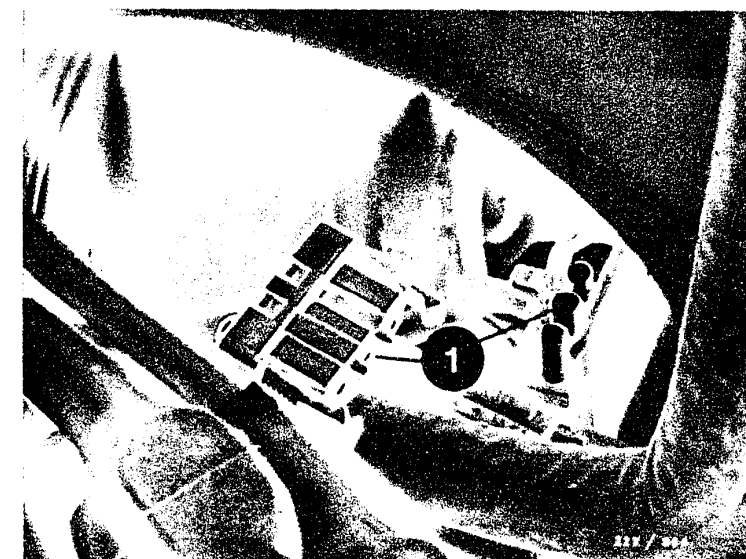
Yes

Continued on J5/J6



1 = Diagnostic socket  
2 = Vacuum hose

1 = Throttle-valve switch plug  
connector



J3

Trouble-shooting program  
Mercedes Benz



J4

Trouble-shooting program  
Mercedes Benz



Yes

Check throttle-valve switch idle contact. Switch off ignition. Disconnect KE-Jetronic control-unit plug (not shown). Disconnect electronic-ignition control-unit plug and connect ohmmeter to term. 2 and vehicle ground. See top picture. Throttle-valve switch plug connector connected. Throttle valve is in idle position. Ohmmeter must indicate approx.  $0\ \Omega$  (continuity). Open throttle valve. Ohmmeter must indicate  $\infty\ \Omega$ . Resistance O.K.?

No

1. Disconnect the plug connection from the throttle valve switch. See the Figure at the center. Connect an ohmmeter one after the other to:

Throttle valve switch plug connection (Center picture)

Electronic ignition control unit plug

Term. 1 and Term. 2 and

Term. 2 and vehicle ground

The ohmmeter must read approx.  $0\ \Omega$  (continuity). Eliminate any break.

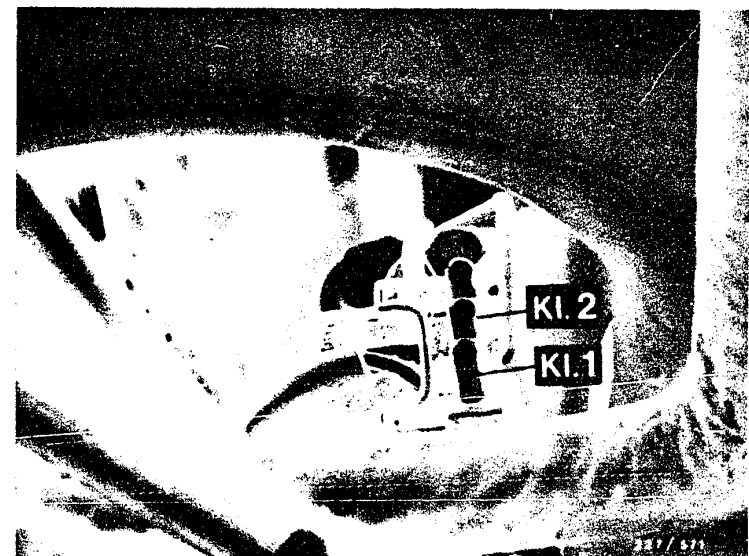
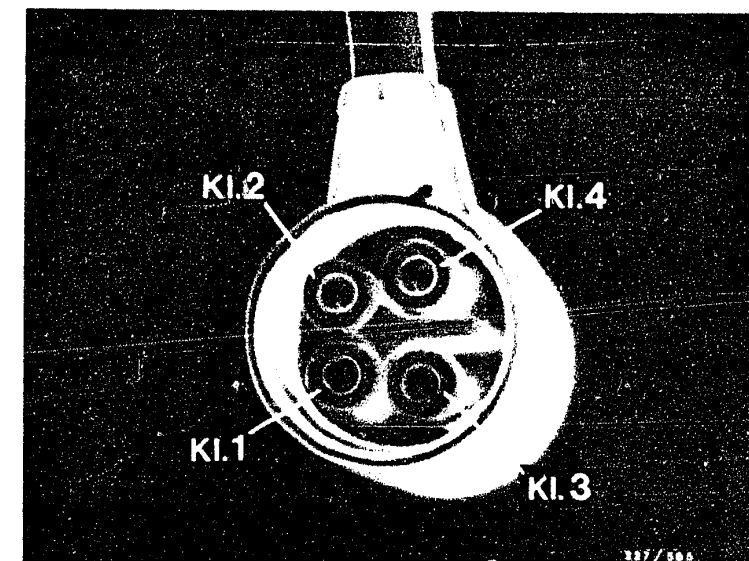
2. Connect the ohmmeter to the throttle valve switch plug connection Term. 1 and Term. 2. See the Figure at the bottom. The throttle valve is closed. Resistance approx.  $0\ \Omega$

Open the throttle valve. The ohmmeter must read  $\infty\ \Omega$ .

If resistance not O.K., replace throttle-valve switch.

Yes

Continued on J7/J8



J5

Trouble-shooting program  
Mercedes Benz



J6

Trouble-shooting program  
Mercedes Benz



yes

Check the voltage supply to the electronic ignition control unit and the ignition coil.

Connect the voltmeter and test prod to the diagnosis socket Term. 5 (+) and the battery terminal (-). See the Figure.

Run the engine at idle.

The voltage measured must be 12 ... 14 V and must not be more than 1 V less than battery voltage.

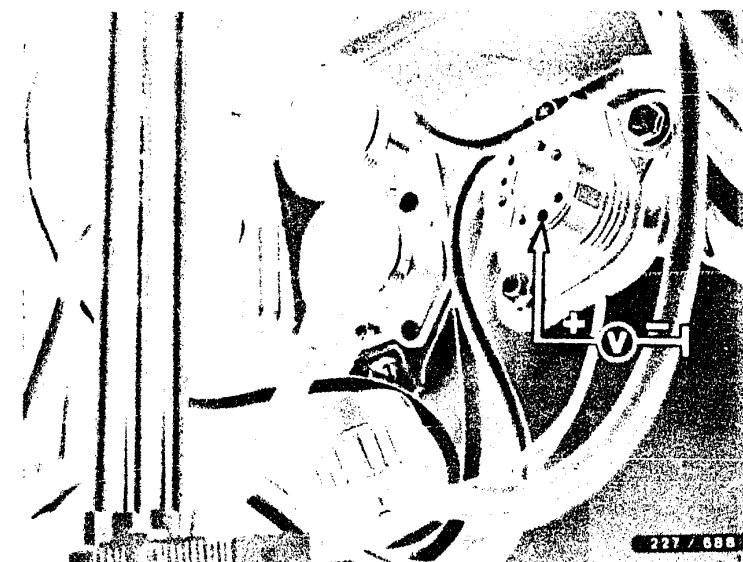
Is the value for voltage O.K.?

no

Disconnect the positive lead from the battery. Switch the ignition on. Check the leads from the positive battery terminal to the ignition coil Term. 15 for contact resistance.

Max. contact resistance 0.3  $\Omega$ .  
(Take the resistance of the test lead and the test prods into consideration.)

Eliminate any contact resistance.



Diagnosis socket

yes

Continued on J9/J10

**J7**

Trouble-shooting program  
Mercedes-Benz



**J8**

Trouble-shooting program  
Mercedes-Benz

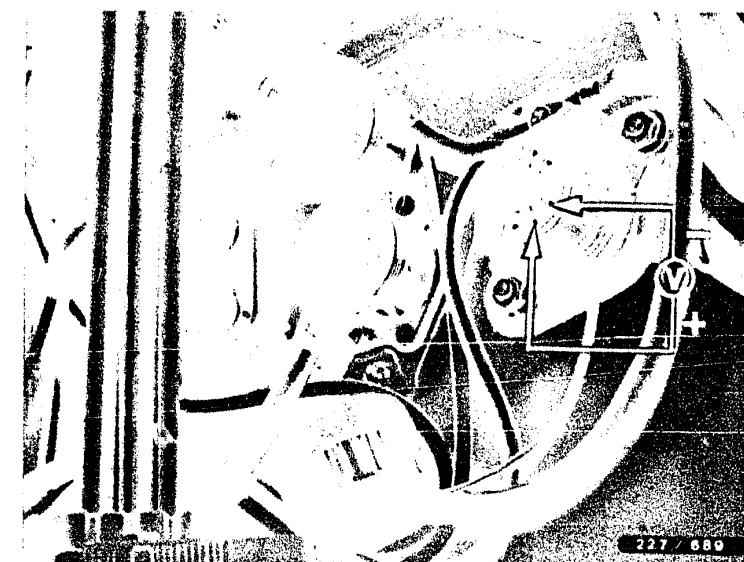


yes

Check peak-coil-current cut-off.  
Connect voltmeter with test prods to diagnostic socket term. 5 (+) and term. 4 (-).  
Switch the ignition on. For approx. 1 sec. the voltmeter can move a short distance.  
The voltmeter must return to 0 V.  
Is the value for voltage (0 V) O.K.?

no

Take out and replace the electronic ignition control unit and the ignition coil.



Diagnosis socket

yes

Continued on J11/J12

**J9**

Trouble-shooting program

Mercedes Benz



**J10**

Trouble-shooting program

Mercedes Benz



yes

Test primary voltage.  
(If MOT series available).  
Connect oscilloscope (e.g. MOT 201) together  
with pulse shaper 1 684 463 154 to ignition  
coil according to operation instructions.  
Note: Incorrect reading without pulse shaper.  
Allow engine to idle.  
Measured primary voltage must be 280-360 V.  
See graph.

Voltage correct?

no

Take out and replace the electronic  
ignition control unit.

yes

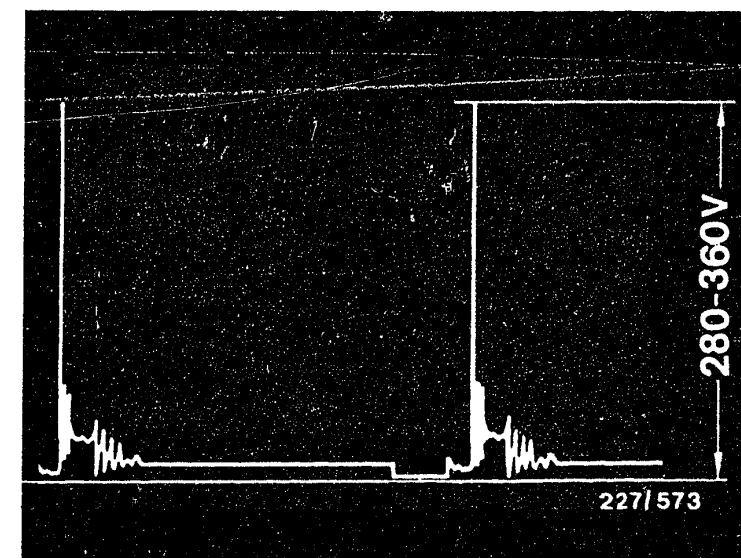
Ignition system O.K.

Test completed

Tests starting at J13 no longer  
necessary.

Note:

If customer complaint is not yet remedied,  
then check for further possible faults in  
the fuel system, or engine not mechanically  
O.K.



J11

Trouble-shooting program

Mercedes Benz



J12

Trouble-shooting program

Mercedes Benz



No primary voltage or no ignition spark.

(Continued from H9/H10)

yes

Check insulation of pulse generator.

Disconnect the electronic ignition control unit plug and connect an ohmmeter to Term. 7 and the battery terminal (-). See the Figure at the top. The ohmmeter must read  $\infty \Omega$ . Is the value for resistance O.K.?

no

If the value for resistance is approx.  $0 \Omega$ , take out and replace the pulse generator. See the Figure at the bottom.

yes

Check the internal resistance of the pulse generator.

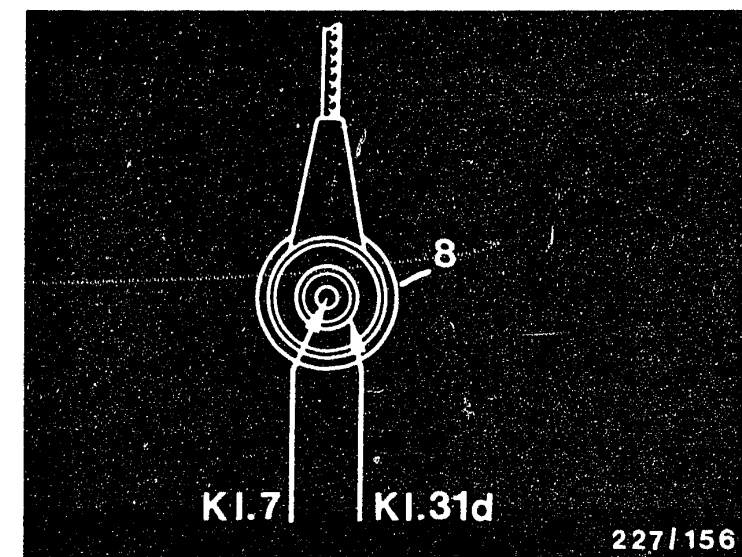
Disconnect the electronic ignition control unit plug and connect an ohmmeter to Term. 7 and Term. 31d. See the Figure at the top. The ohmmeter must read 680 ... 1200  $\Omega$ . Is the value for resistance O.K.?

no

Take out and replace the pulse generator. See the Figure at the bottom.

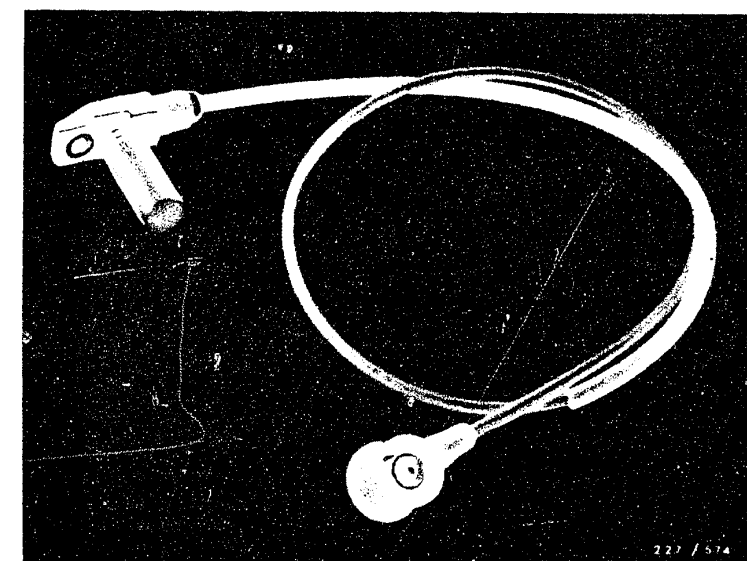
yes

Continued on J15/J16



8=Electronic ignition control unit plug - pulse generator

Pulse generator



**J13**

Trouble-shooting program  
Mercedes Benz

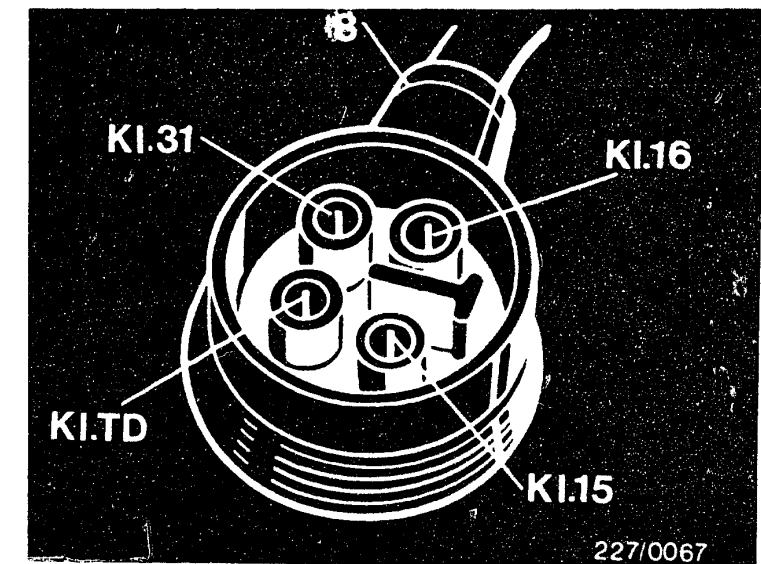
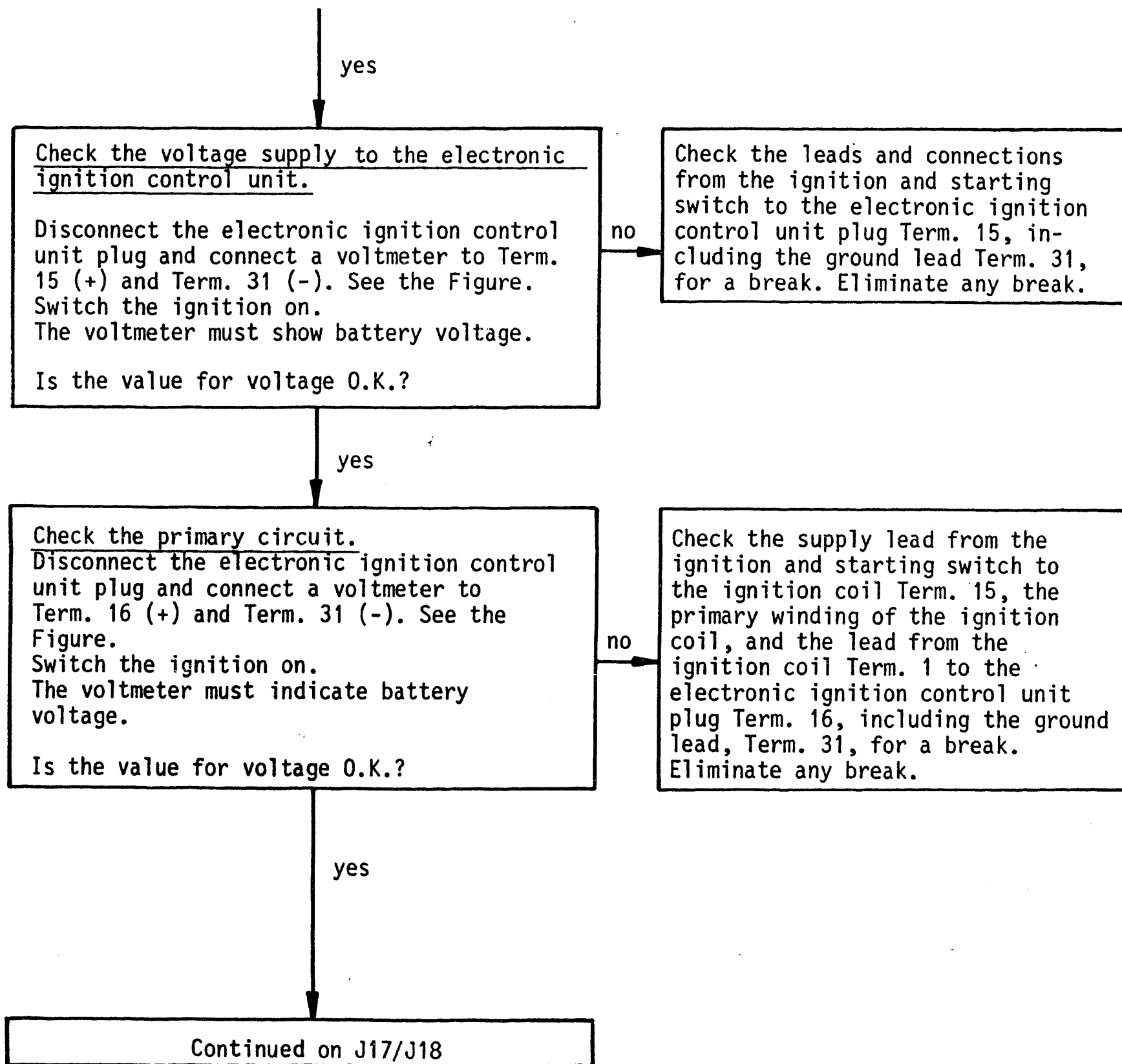


**J14**

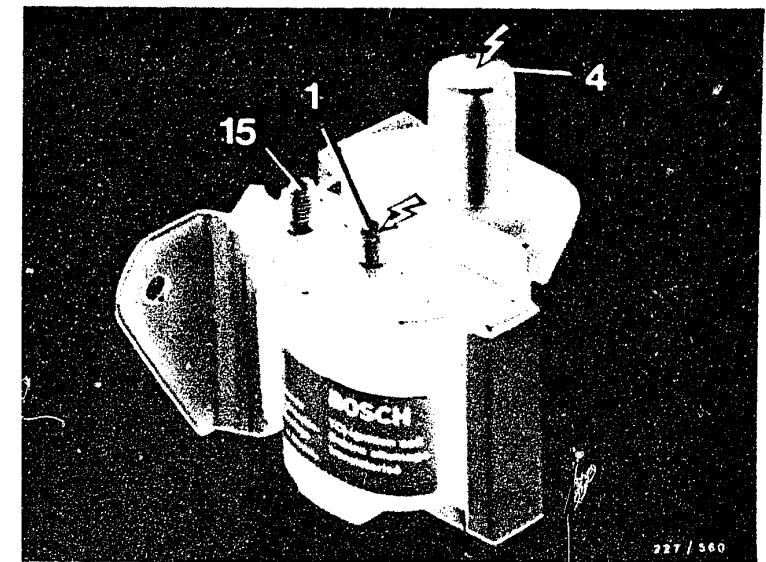
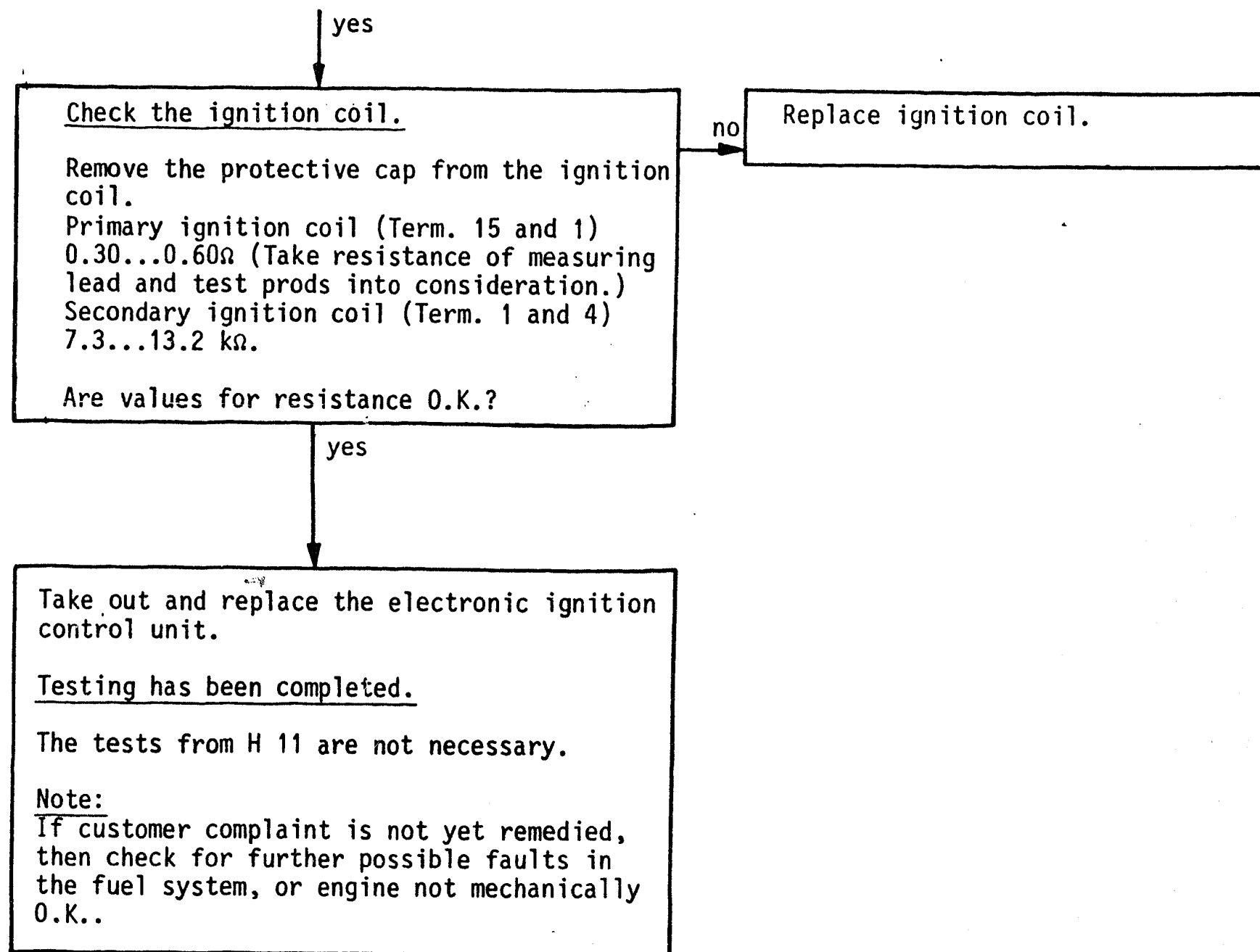
Trouble-shooting program  
Mercedes Benz







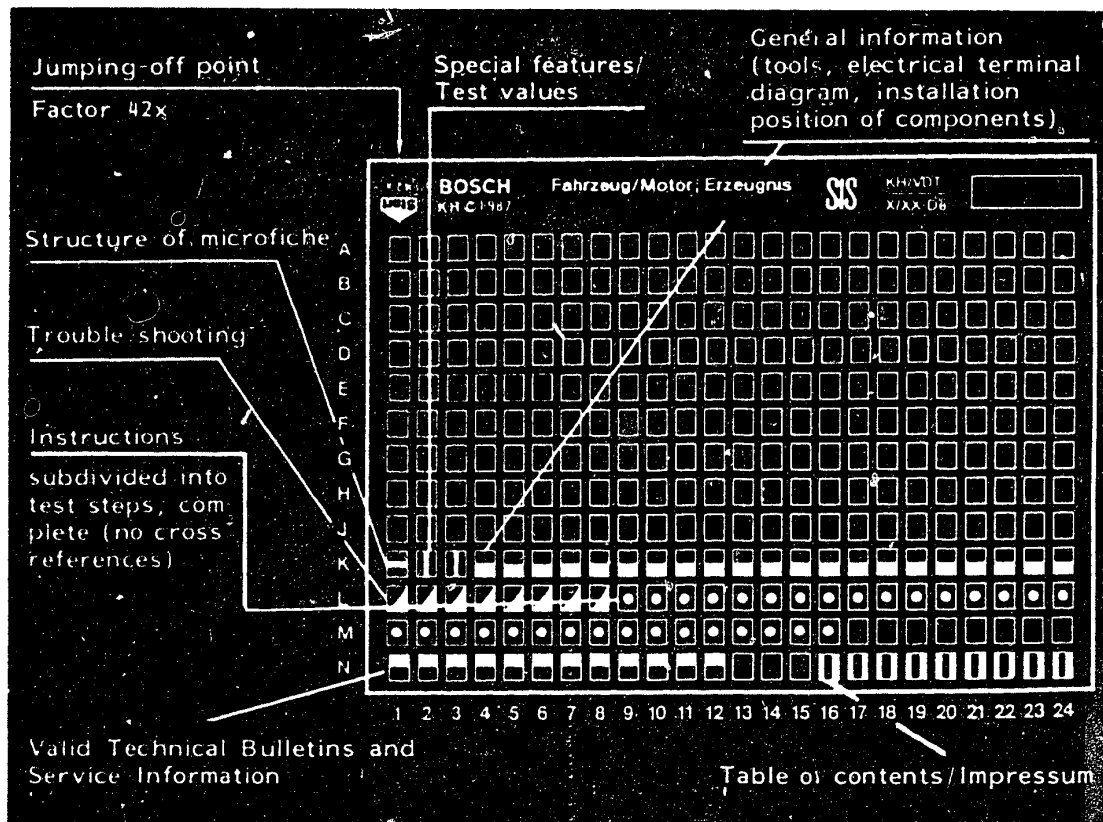
8=Electronic ignition control unit plug



High voltage arrows:  
Warning, 400 V ... 25 kV!



## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

**C6**

**K1**

Trouble-shooting program



## 1. Special features

Mercedes-Benz 300 E, 6-cyl. engine 103.980, year of manufacture 1985

Equipped with:

EI control unit 0 227 400 5.. (with current limitation) or control units from Siemens AG (service part Daimler-Benz AG)

Note: Bosch and Siemens control units are interchangeable.

Ignition coil 0 221 5..

## 2. Test specifications

Primary ignition coil		0.3 ... 0.6 $\Omega$	<b>L11</b>
Secondary ignition coil		7.3 ... 13.2 k $\Omega$	
Coolant temperature sensor	+ 20°C	2.1 ... 2.9 k $\Omega$	<b>L17</b>
	+ 30°C	1.4 ... 2.0 k $\Omega$	
	+ 80°C	280 ... 370 $\Omega$	
	+ 90°C	210 ... 280 $\Omega$	
	+ 100°C	160 ... 215 $\Omega$	
Trimming plugetting position	1 =	$\infty$ $\Omega$	<b>L19</b>
	2 =	2.4 k $\Omega$	
	3 =	1.3 k $\Omega$	
	4 =	750 $\Omega$	
	5 =	470 $\Omega$	
	6 =	220 $\Omega$	
	7 =	0 $\Omega$	



Ignition timing without vacuum  
Engine M 103.980 23...27° BTDC at 3200 min<sup>-1</sup>

**L15**



**M1**

To prevent incorrect measurements,  
test must be performed as des-  
cribed on Coordinates given on  
right.

Electronic-ignition control 12 ... 14 V  
unit power supply max. 1 V  
and ignition coil with below  $V_B$   
engine idling

**M5**

Primary voltage 280 ... 360 V  
with engine idling

**M9**

Internal resistance of 680 ... 1200  $\Omega$   
pulse generator

**M11**

Insulation, pulse generator  $\infty \Omega$

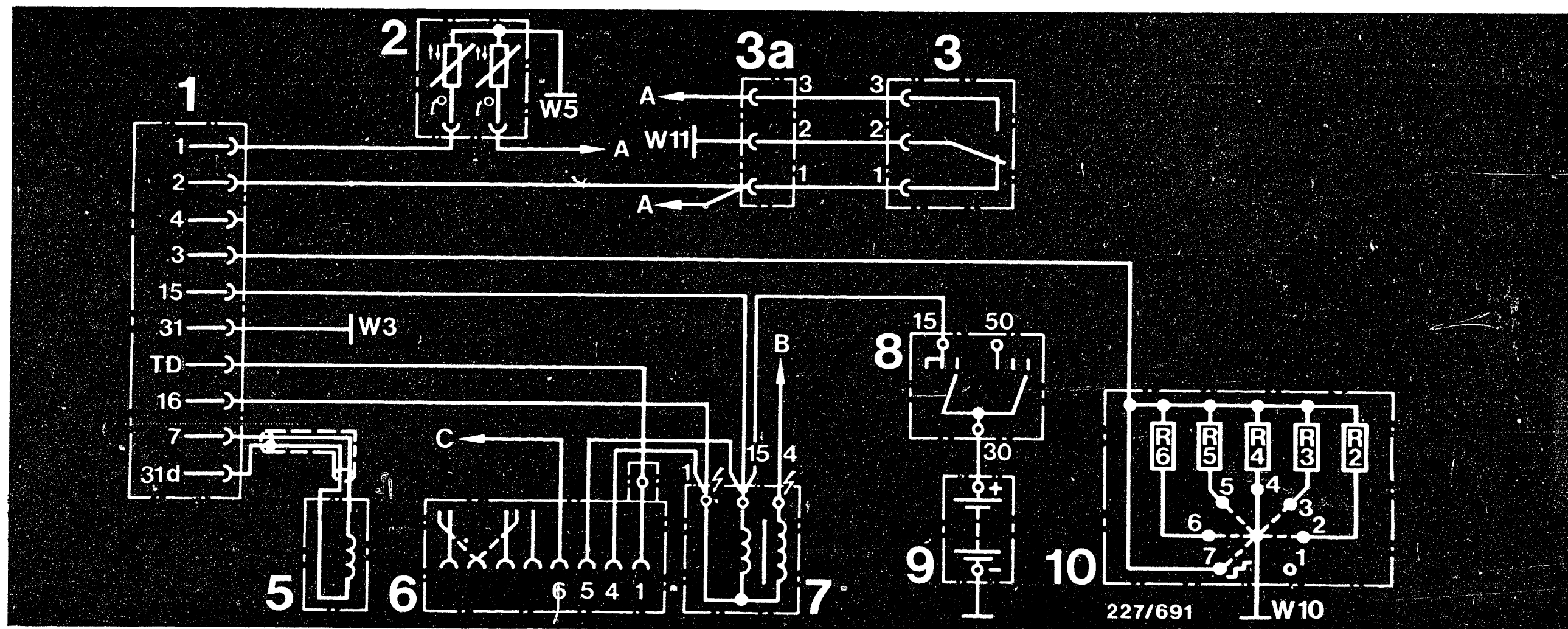
See Autodata test specifications for settings for  
idle speed, exhaust etc.

**K3**

Test specifications

Mercedes Benz





Danger arrows:  
Warning: 400 V ... 25 kV

1 = Electronic-ignition control unit  
2 = Coolant temperature sensor  
(double NTC)  
3 = Throttle-valve switch  
3a = Throttle-valve switch  
plug connector

5 = Pulse generator  
6 = Diagnostic socket  
7 = Ignition coil  
8 = Ignition/starting switch  
9 = Battery  
10 = Trimming plug

A = to KE-Jetronic  
control unit  
B = to high-voltage  
distributor  
C = Plug connector  
engine term. 30

W 3 = Ground, wheel  
housing front left  
(ignition coil)  
W 5 = Ground, engine  
W10 = Ground, battery  
W11 = Ground, engine  
(electric lead  
screwed on)

### 3. Electrical terminal diagram

**K4**

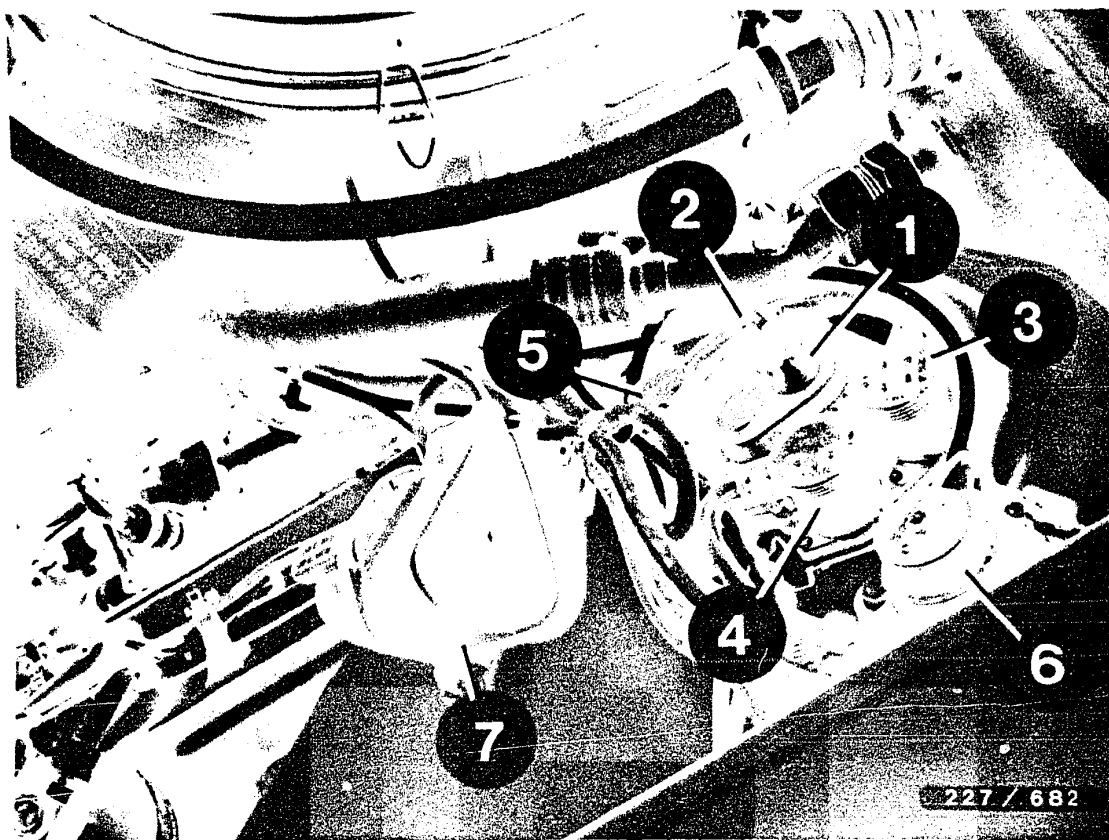
Electrical terminal diagram  
Mercedes Benz



**K5**

Electrical terminal diagram  
Mercedes Benz



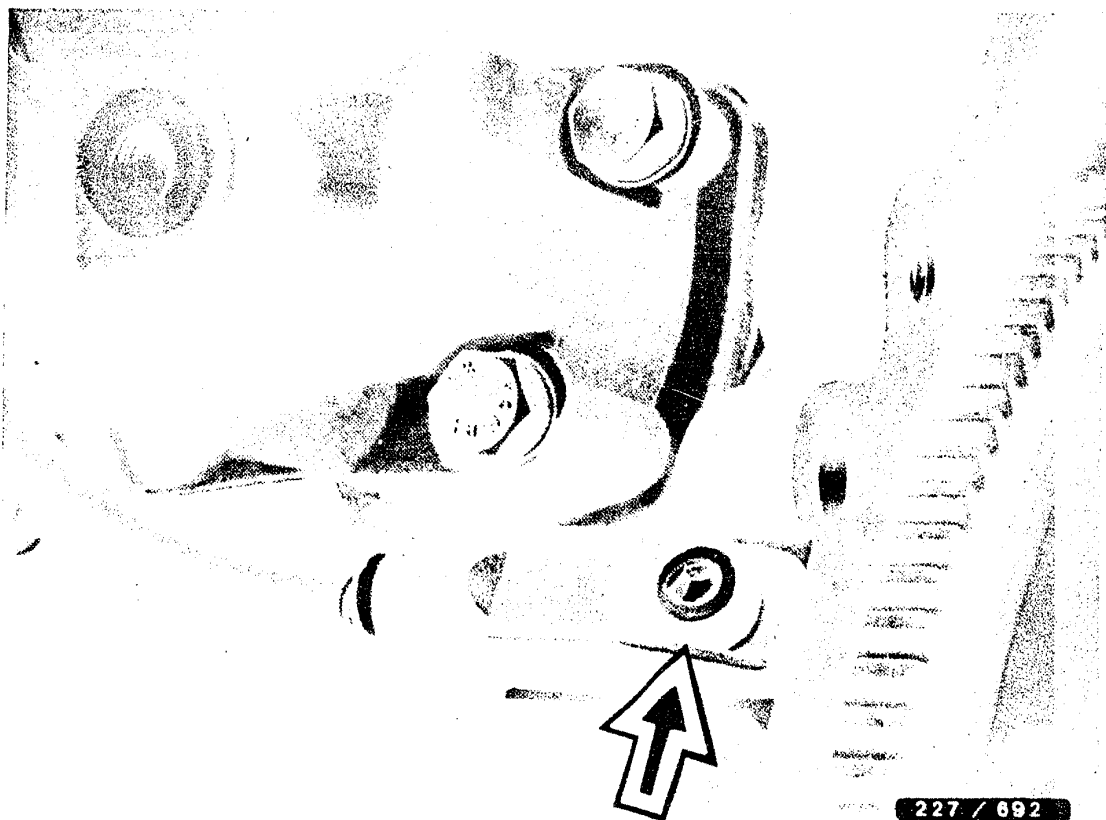


- 1 = Electronic ignition control unit
- 2 = Vacuum hose
- 3 = Quadruple plug - power supply
- 4 = Quadruple plug - sensor
- 5 = Coaxial plug - pulse generator
- 7 = Plastic ignition coil with protective cover

#### 4. Installation position of components

Electronic-ignition control unit, diagnostic socket and ignition coil are situated on the wheel housing on the left-hand side as viewed in the forward direction of travel.





227 / 692

Arrow = Pulse generator

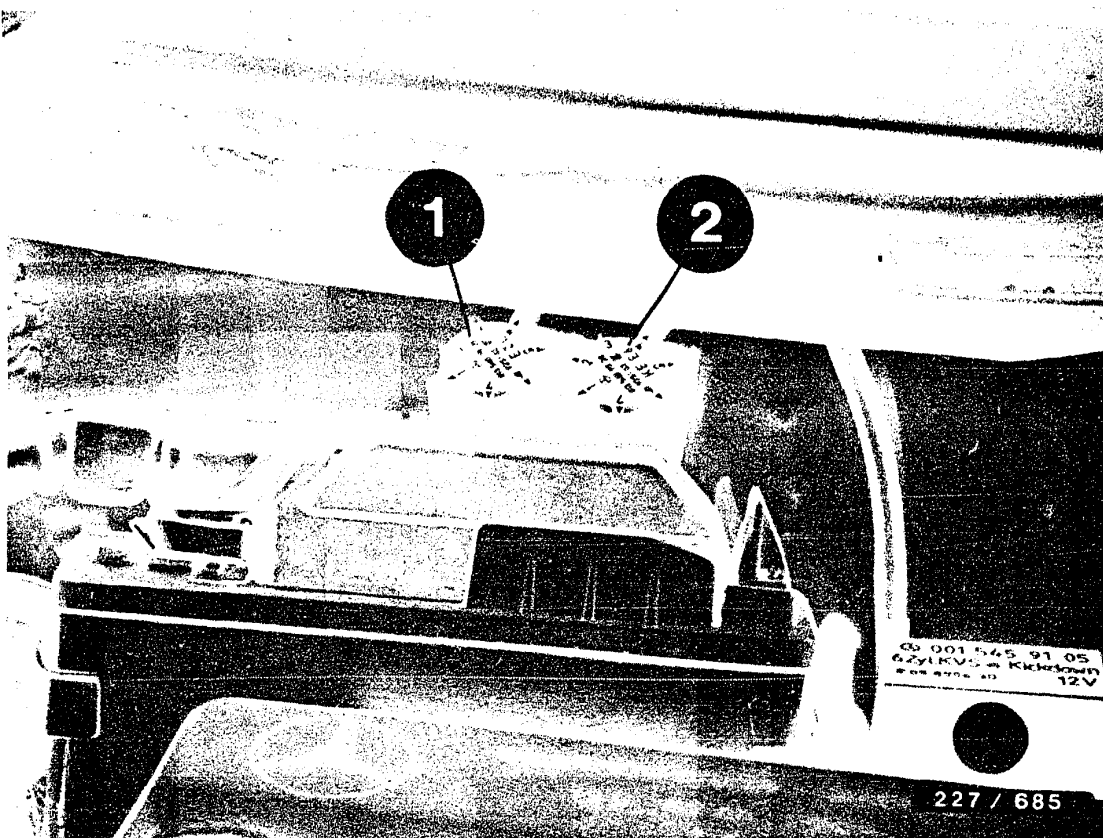
The pulse generator is located on the engine block on the left, looking in the direction of forward vehicle travel.

**K7**

Installation position of components  
Mercedes Benz



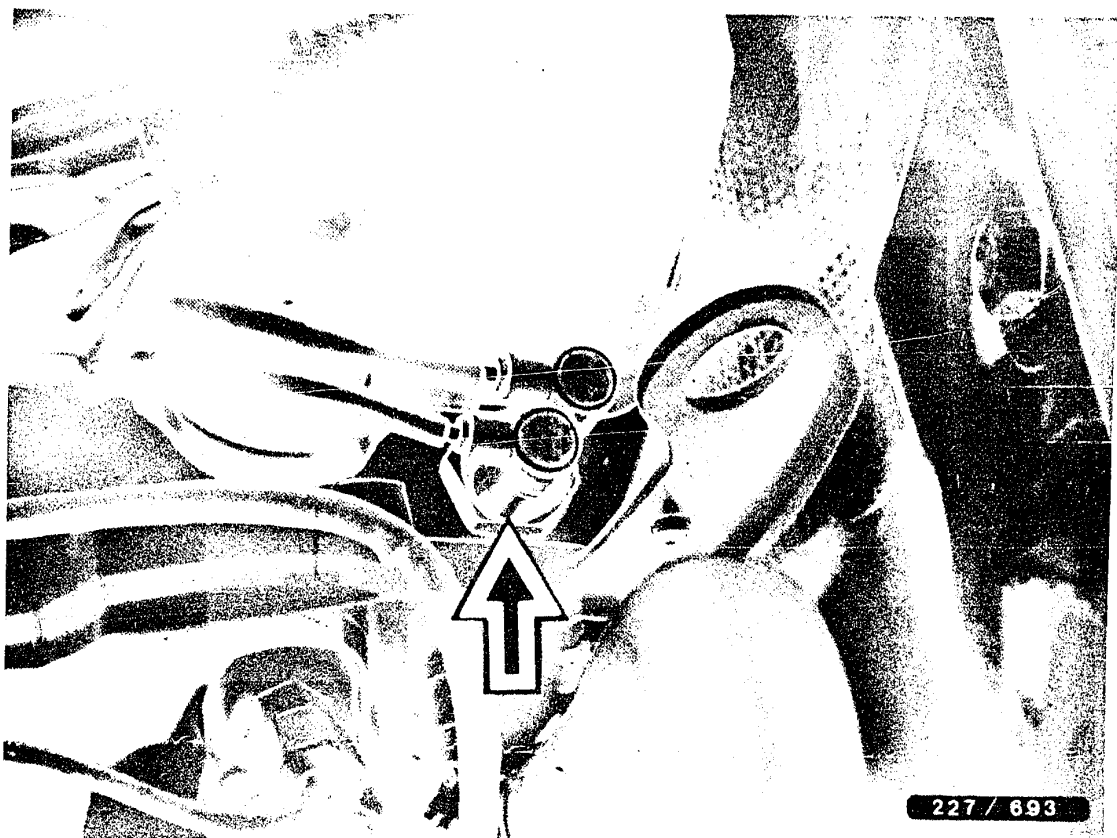




- 1 = Ignition trimming plug  
2 = Mixture-map trimming plug

Trimming plugs are situated in the equipment space behind the battery.





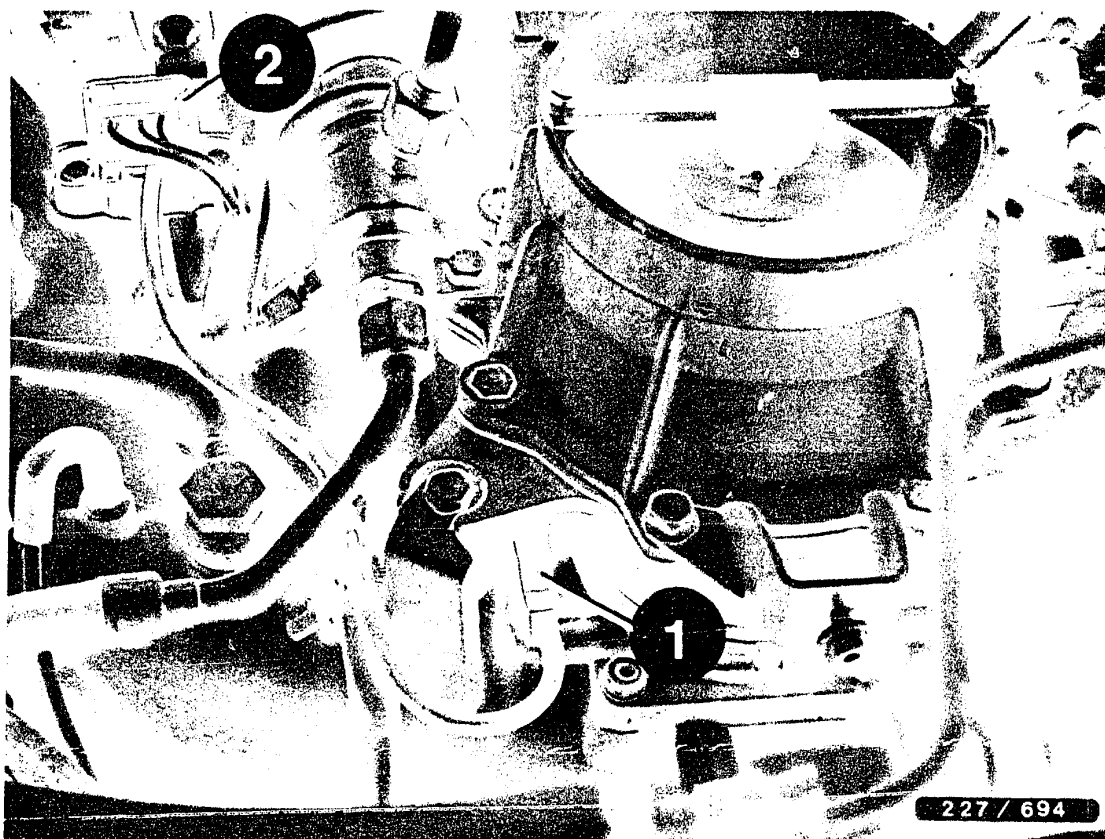
Arrow = Coolant temperature sensor (double NTC)

The coolant temperature sensor is situated on the side of the cylinder head.

**K9**

Installation position of components  
Mercedes Benz





1 = Throttle-valve switch

2 = Plug connection from the throttle valve switch

The throttle-valve switch is located on the throttle-valve assembly.

**K10**

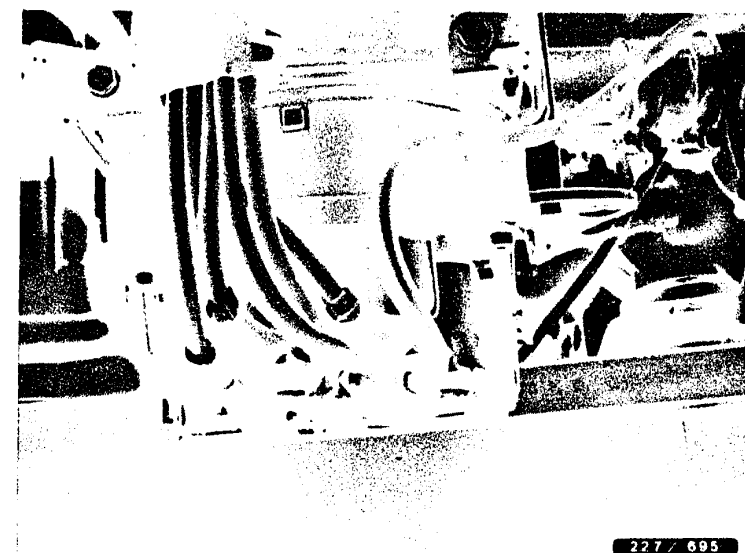
Installation position of the components  
Mercedes Benz



The high-voltage distributor (see top picture) is mounted on the front cover of the cylinder head and is driven directly by the camshaft by the driver (see bottom picture, arrow).

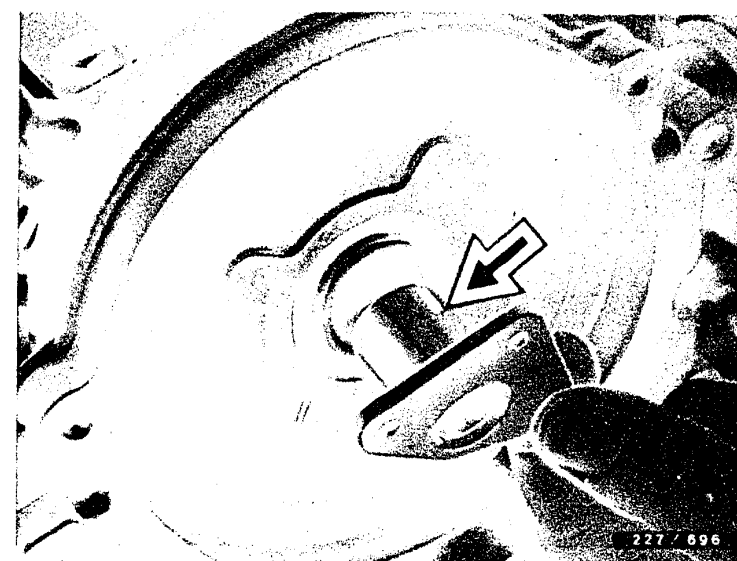
The ignition cables on the distributor cap should be mounted in the sequence 1, 3, 6, 2, 4, 5 (proper routing of ignition cables).

See next Coordinate for information on removal.



High- voltage distributor

Driver



**K11**

Installation position of components  
Mercedes Benz



**K12**

Installation position of components  
Mercedes Benz

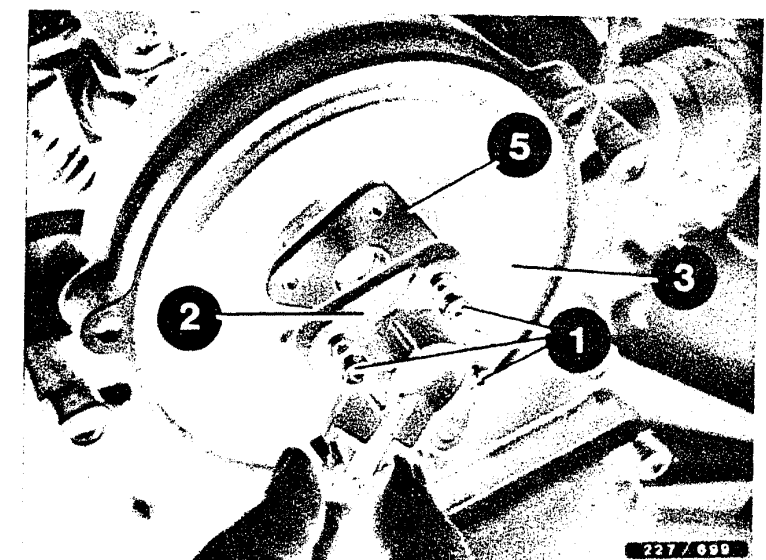
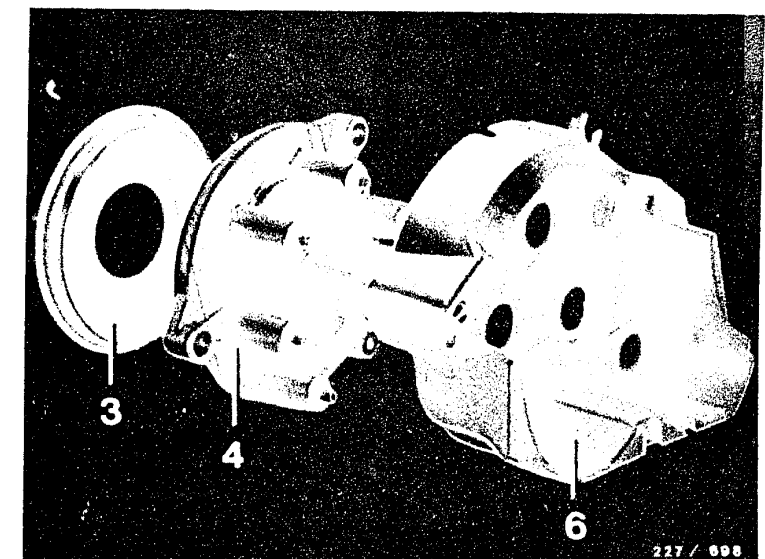
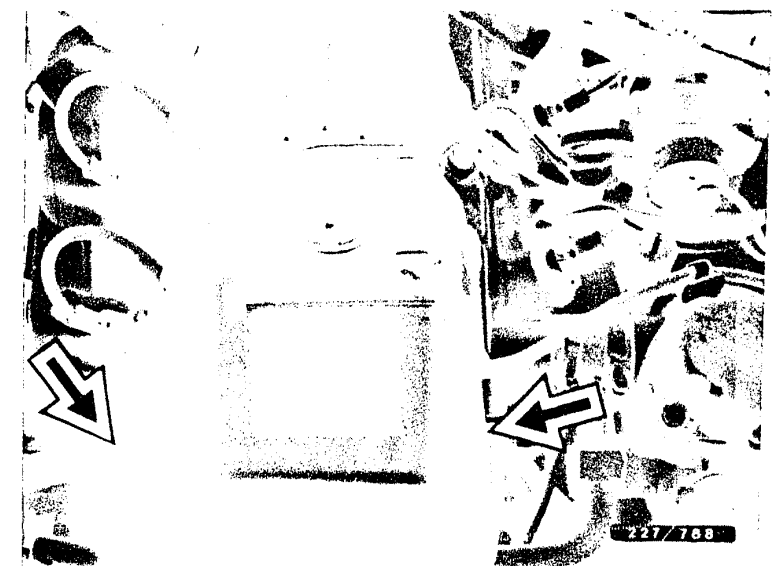


### Notes on removal, high-voltage distributor

Unclip cover at side (see upper illustration, arrows) and pull upward.

#### Key to picture

- Item 1 = Fastening screws
- Item 2 = Distributor rotor
- Item 3 = Sealing disc
- Item 4 = Distributor cap
- Item 5 = Driver
- Item 6 = Screening cover



**K13**

Installation position of components  
Mercedes Benz



**K14**

Installation position of components  
Mercedes Benz



## 5. Necessary test equipment and aids

Motortester e.g.	MOT 201	0 684 000 201
Pulse shaper (required for measuring the primary voltage with MOT 201, 202, 206 and 400)		1 684 463 154
Adapter lead for the diagnosis socket		1 684 463 094
Spark gap e. g. ignition coil and condenser tester	EFAW 106 A	0 681 100 001
or single spark gap	EF 1177/7	1 684 531 000
5 k $\Omega$ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontava Wh2	commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Thermal conduction paste		5 942 860 003
Test prod, black		1 684 085 034
Test prod, red (for proper connection of test instruments to connection plugs)		1 684 485 035



## 6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).

If, while testing the ignition system or during adjustment work on the engine (e.g. KE-Jetronic), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.







7. Incorrect indication of engine speed, dwell angle and ignition point

In the case of ignition systems with control unit 0 227 400 5.. or control units from Siemens (electronic ignition) with current limitation, there can be an incorrect reading for engine speed, dwell angle, and ignition timing on the test instruments.

For further details see coordinates N 7 - N 11.

**K19**

Incorrect reading on test instruments

Mercedes Benz



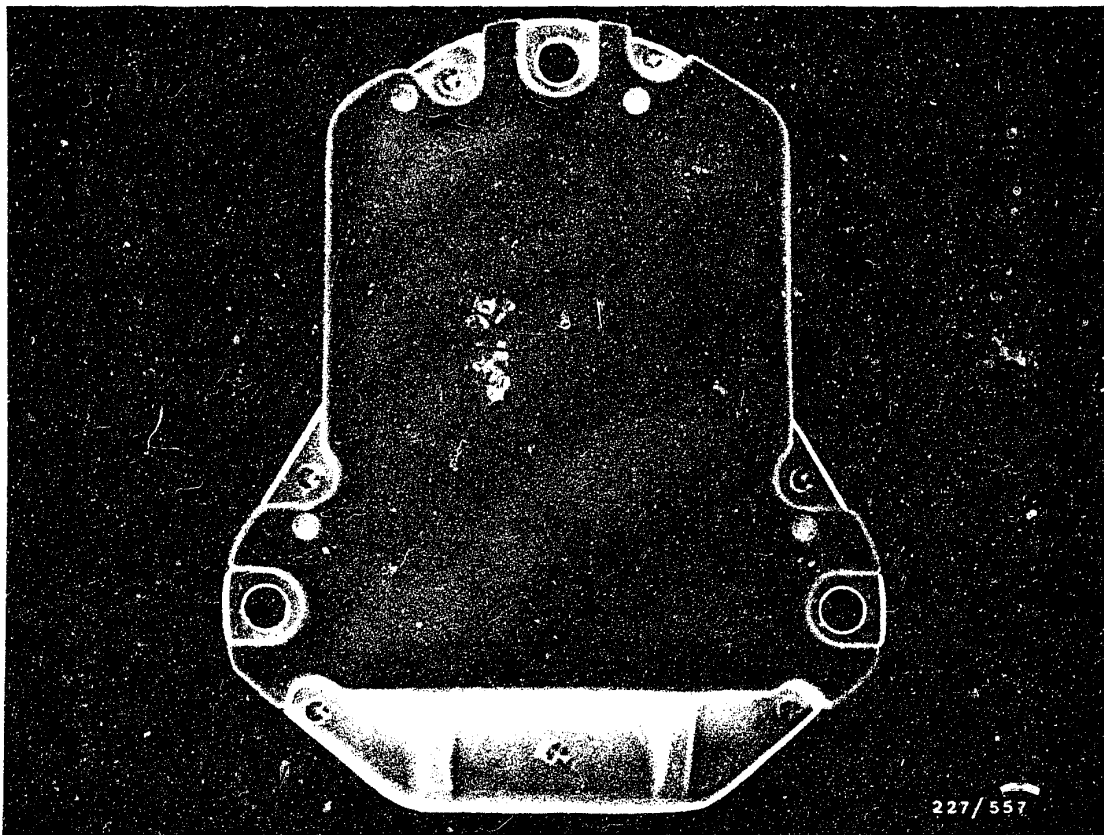
## 8. Important vehicle information

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- For a compression test, disconnect the coaxial plug (pulse generator) from the electronic ignition control unit.
- Never disconnect the battery while the engine is running.
- A starting assist with more 16 Volts or with a quick-charger is not permitted.
- The specified ignition coil (see Part.No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (the electronic ignition control unit is destroyed).
- The ignition lead from the ignition coil Term. 4 to the high voltage distributor Term. 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15.  
The electronic ignition control unit can be destroyed.



- If the poles are reversed on the ignition coil (Term. 1 and Term. 15) there are severe losses of ignition energy, causing missing. In addition, the electronic ignition control unit is overloaded. In order to preclude reversal of poles, the terminal studs have different diameters. (M5 and M6)
- In order to avoid destruction of the electronic ignition control unit, the secondary end of the ignition system must have interference suppression of min. 2 k $\Omega$ . The original distributor rotor must be installed with an interference suppression resistor of 1 k $\Omega$ .
- If the poles on the battery are incorrectly connected, the electronic ignition control unit and the ignition coil are destroyed.



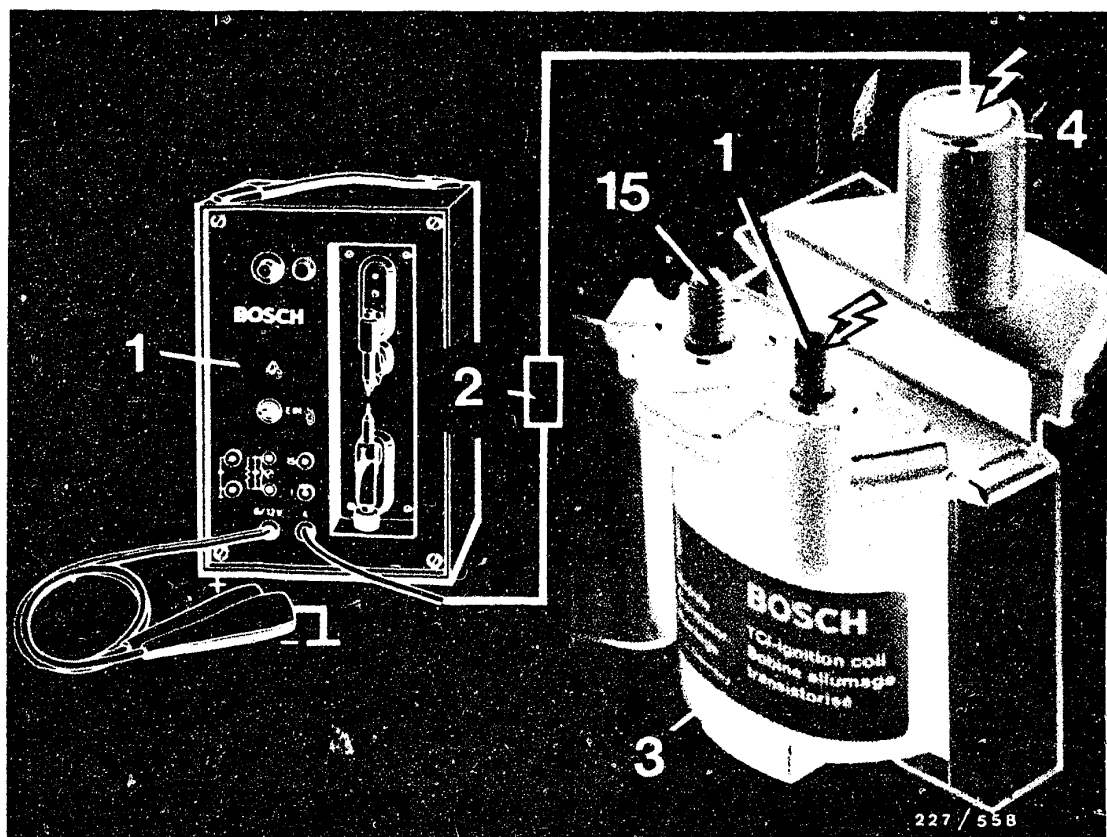


- Before putting on the electronic ignition control unit, the base plate (see the Figure, bright surface) must be coated with a heat conduction paste.

Apply thermal conduction paste only with a suitable object (screwdriver, etc.).

Do not apply thermal conduction paste to painted parts.





High voltage arrows:

Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 k sleeve-type suppressor

3 = Ignition coil

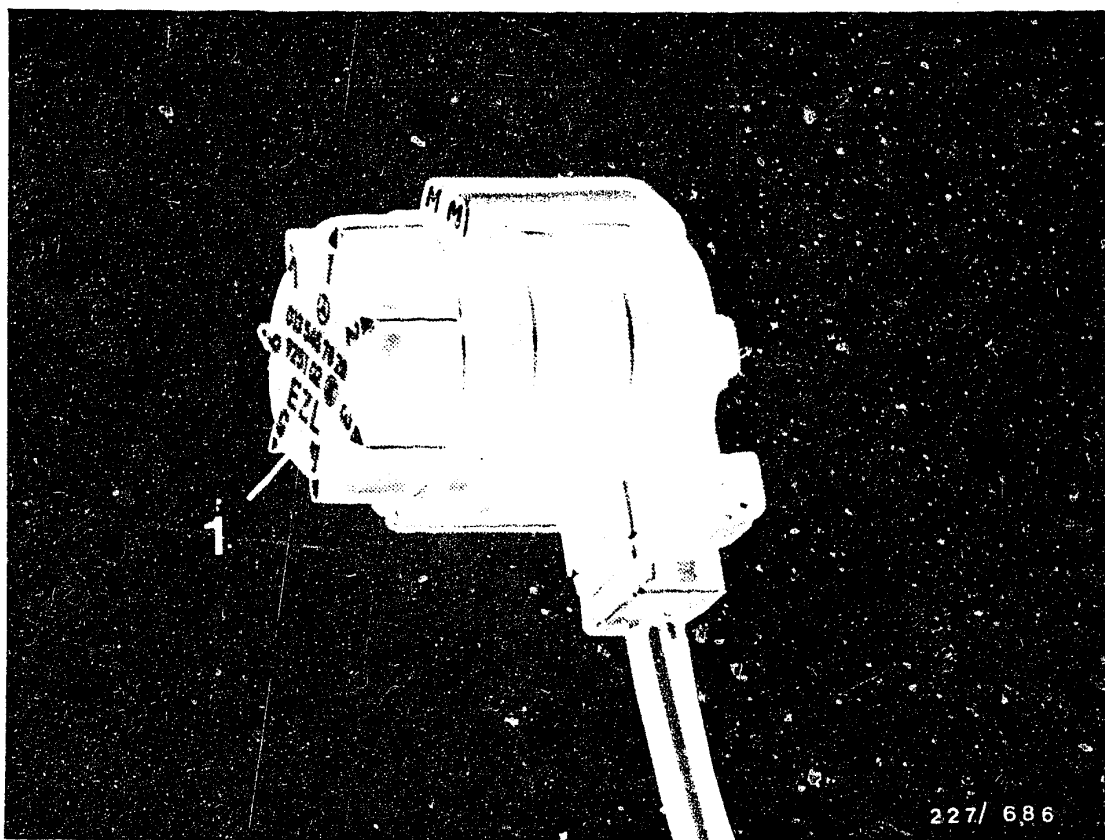
- When using a spark gap - in order to prevent irreparable damage to the electronic-ignition control unit - an interference-suppression resistor of at least 2 k $\Omega$  must be connected between the spark gap and ignition coil terminal 4, e.g. sleeve-type suppressor (5 k $\Omega$ ) 0 356 500 001.

**K23**

Important vehicle information

Mercedes Benz





1 = Trimming plug complete with lead

- If using premium fuel of low octane number, the engine may knock. To prevent any engine damage, the ignition timing can be retarded with the aid of the trimming plug.

Procedure: Pull out trimming plug as far as it will go, make adjustment and push on again. See picture. Each position of the trimming plug retards the ignition timing by approx. 2° crankshaft.

When fuel of the prescribed octane number is again available, return the trimming plug to position "1".

**K24**

Important vehicle information

Mercedes Benz



## 9. Trouble-shooting

### 9.1 How to use the trouble-shooting chart

The trouble-shooting chart starting on Coordinate L 3 contains customer complaint (fault symptom), cause of trouble, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate L 9.

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.

If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

### 9.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate L 9 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 9.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

**L1**

Trouble-shooting  
Mercedes Benz

**L2**

Trouble-shooting  
Mercedes Benz



## 9.4 Trouble-shooting chart

### Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinates

•	•	•	•	•	•	•	•	•	Unclear	Perform detailed trouble-shooting	L 9
•	•	•	•	•	•		•		Spark plugs defective	Assessment by means of ignition oscilloscope or visual examination of spark plug when removed	----
•	•	•	•	•					Shunt on secondary side	Evaluation of the ignition coil, high voltage distributor, ignition harness, and spark plug by means of the ignition oscillogram or a visual inspection	----
•	•	•	•	•					Open circuit on secondary side	Assessment of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope, or continuity test with ohmmeter	----
•									Open circuit on primary side	--	M 13
•	•	•	•	•					Ignition coil defective	-	L 11
		•	•	•	•				Interference-suppression resistors defective	Assessment by means of ignition oscilloscope or resistance measurement	----

**L3**

Trouble-shooting chart

Mercedes Benz



**L4**


Trouble-shooting chart

Mercedes Benz





Customer complaint (fault symptom)

<b>L6</b>	Trouble-shooting chart Mercedes Benz	
-----------	-----------------------------------------	---------------------------------------------------------------------------------------

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start
2. Rough idling
3. Poor throttle response (flat spot during acceleration)
4. Insufficient engine power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine overheats

									<u>Cause of trouble</u>	<u>Test instructions</u>	<u>Coordinates</u>
				●					Electronic ignition control unit not O.K.	---	M 9
●									Pulse generator not O.K.	---	M 11
●									Voltage supply to electronic ignition control unit not O.K.	---	M 13

## 9.5 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Remove the protective cap from the ignition coil.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

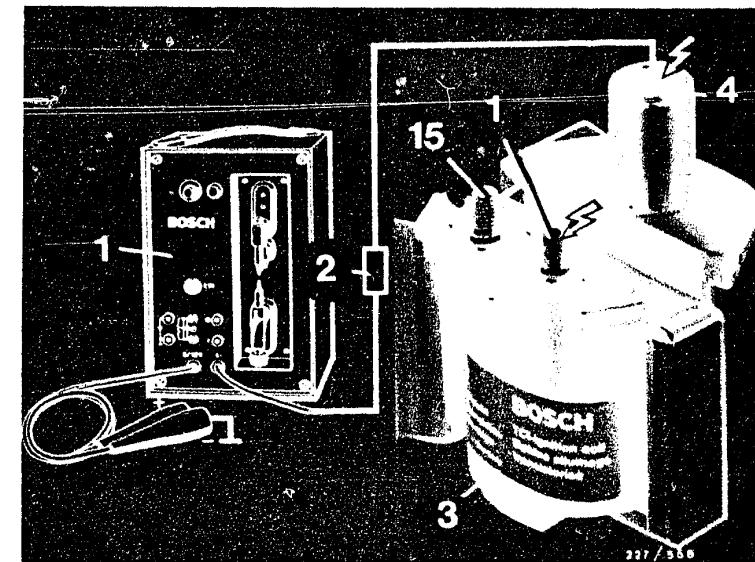
Primary signal present or ignition sparks across spark gap?

yes

Continued on L11/L12

If no primary signal or no ignition spark, continue testing at M11.

Tests from L11 onwards not necessary.



High voltage arrows:

Warning, 400 V ... 25 kV!

1 = Spark gap

2 = 5 k $\Omega$  sleeve-type suppressor

3 = ignition coil

L9

Trouble-shooting program

Mercedes Benz

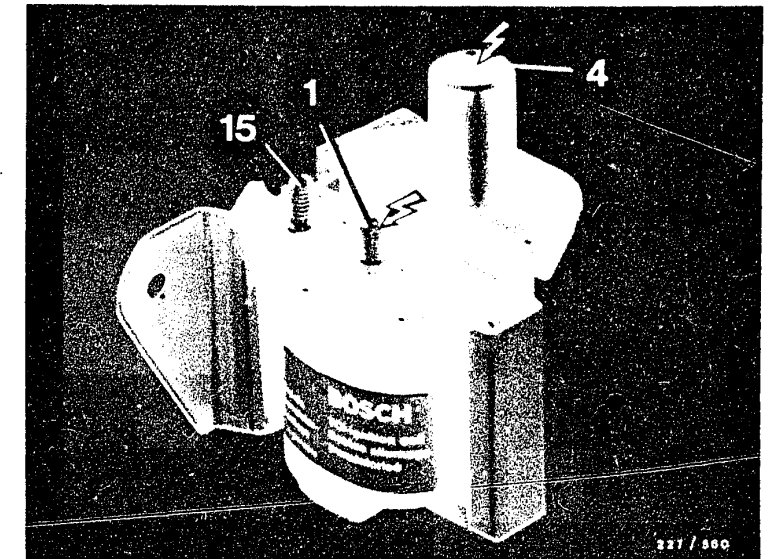
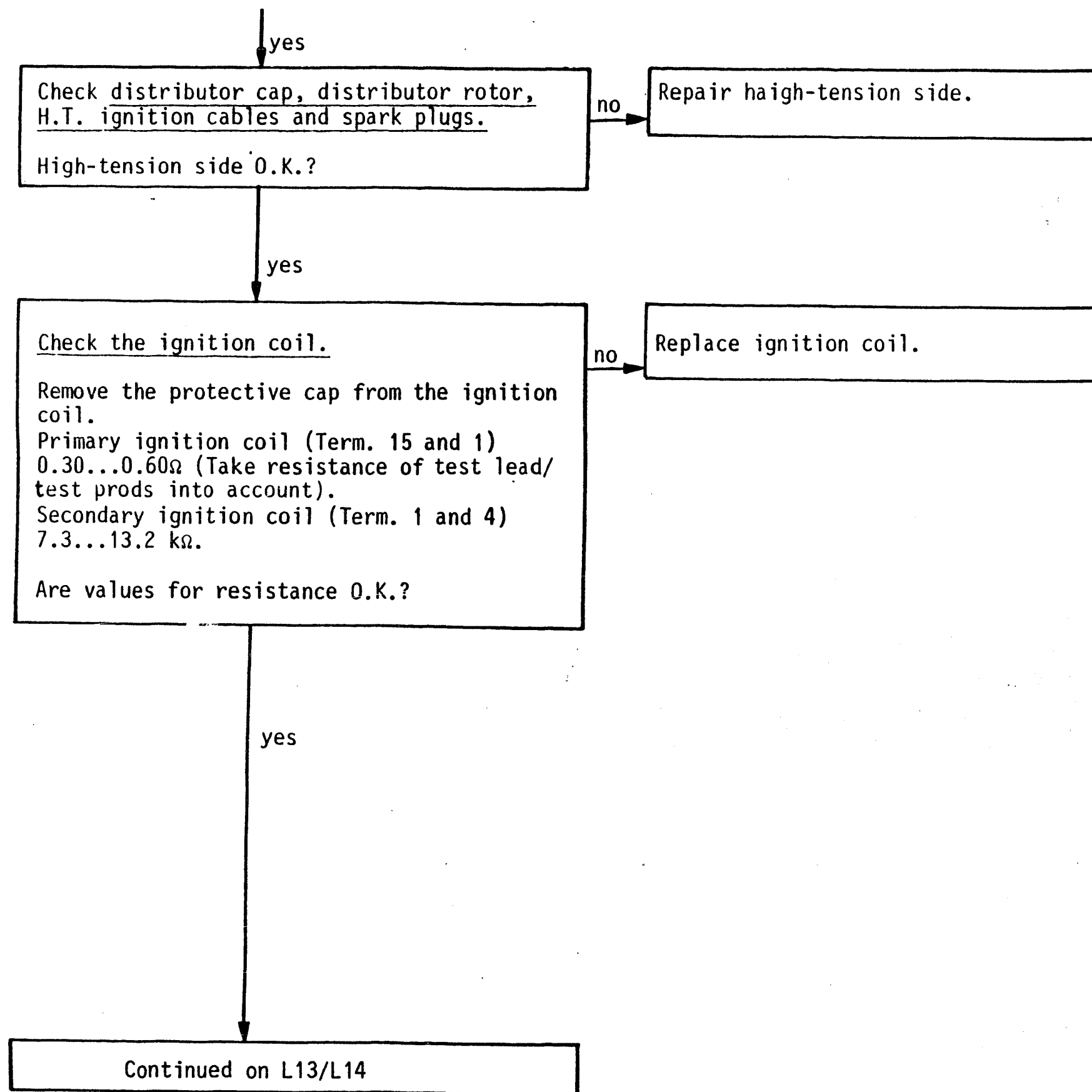


L10

Trouble-shooting program

Mercedes Benz





High voltage arrows:  
Warning, 400 V ... 25 kV!

**L11**

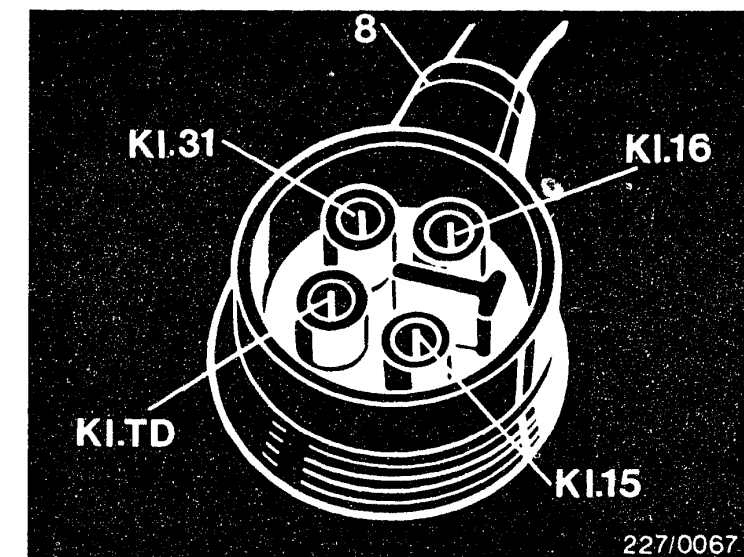
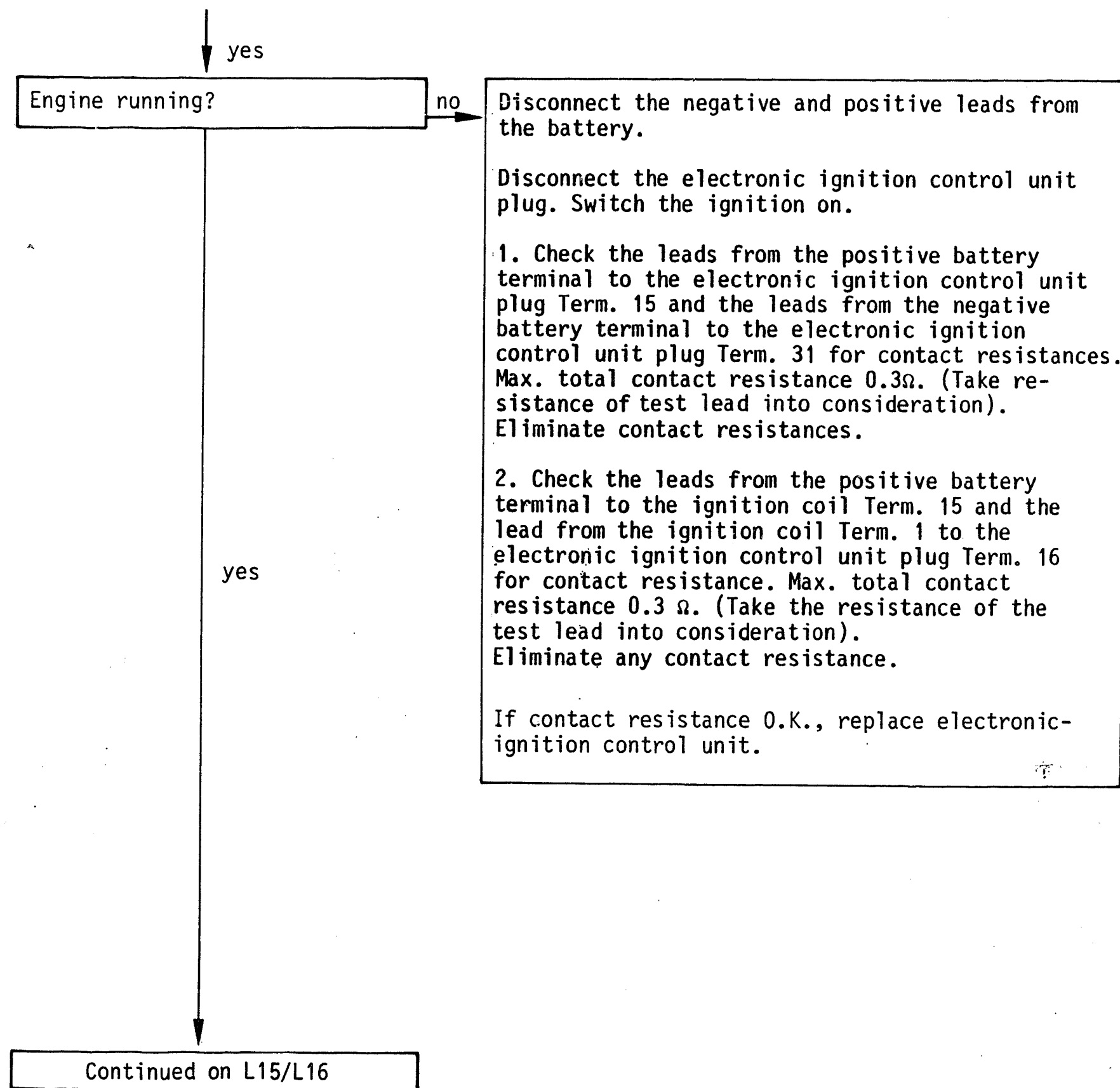
Trouble-shooting program  
Mercedes Benz



**L12**

Trouble-shooting program  
Mercedes Benz





8 = Electronic ignition control unit plug

**L13**

Trouble-shooting program  
Mercedes Benz



**L14**

Trouble-shooting program  
Mercedes Benz



yes

### Check the pressure sensor

Connect the motortester to the diagnosis socket using an adapter cable. Disconnect the vacuum hose from the electronic ignition control unit. See the Figure at the top.

Take the plug connection from the throttle valve switch apart. See the Figure at the bottom. Run the engine at idle.

Take reading for timing angle.

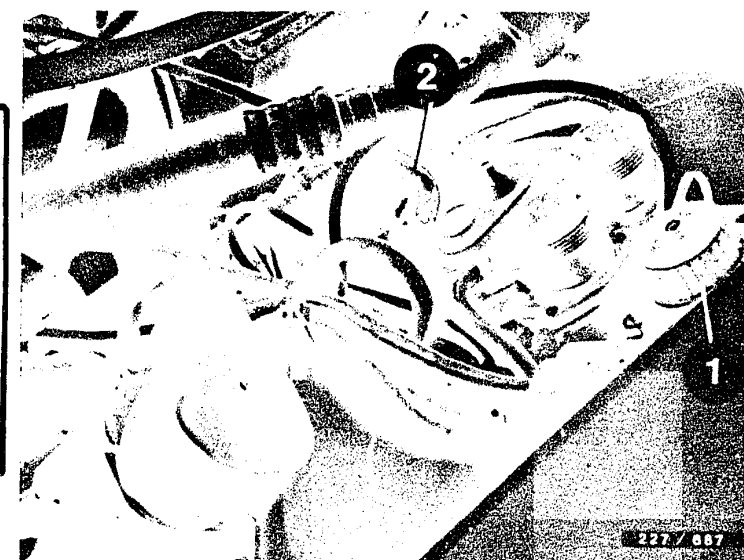
Put the vacuum hose back on the electronic ignition control unit. When this is done, the timing angle must change noticeably (in the direction "advance").

Did the timing angle change?

no

1. Check the vacuum hose from the electronic ignition control unit to the intake manifold plug connection for leaks. Eliminate any leaks.

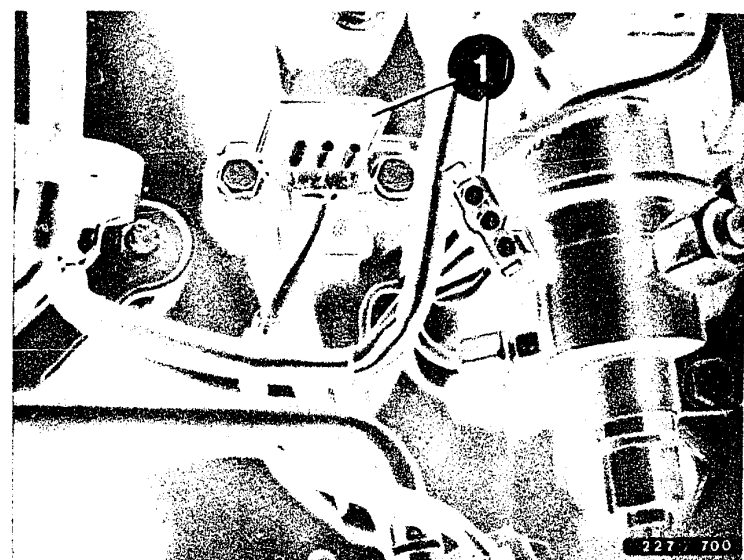
2. If there was no leak, take out and replace the electronic ignition control unit.



1=Diagnosis socket  
2=Vacuum hose

yes

1=Plug connection from the throttle valve switch



Continued on L17/L18

**L15**

Trouble-shooting program  
Mercedes Benz



**L16**

Trouble-shooting program  
Mercedes Benz



yes

Check the coolant temperature sensor.

Warm the engine up to normal operating temperature.  
Connect the motortester to the diagnosis socket using an adapter lead.  
Disconnect vacuum hose from electronic-ignition control unit (not shown).  
Take apart throttle-valve switch plug connector (top picture Item 1).  
Run engine at idle.  
Take reading for timing angle.  
Disconnect the coolant temperature sensor plug (color of cable green/black).  
See arrow in center picture).  
When this is done, the timing angle must change.

Did the timing angle change?

yes

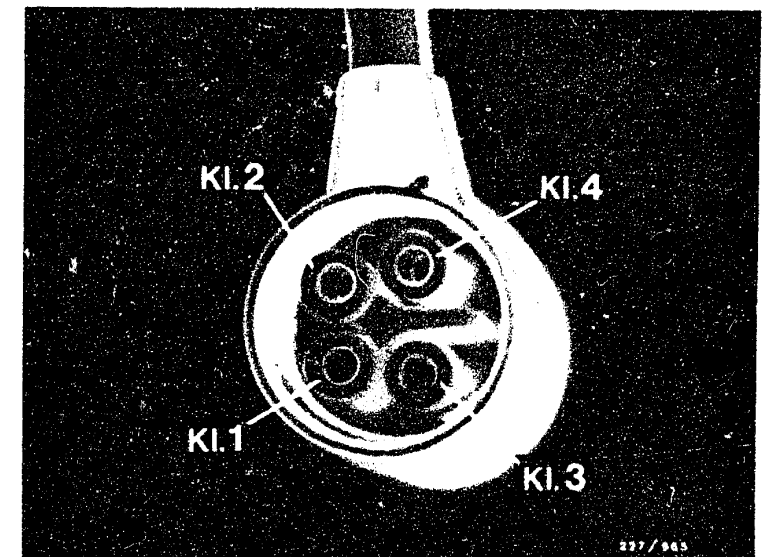
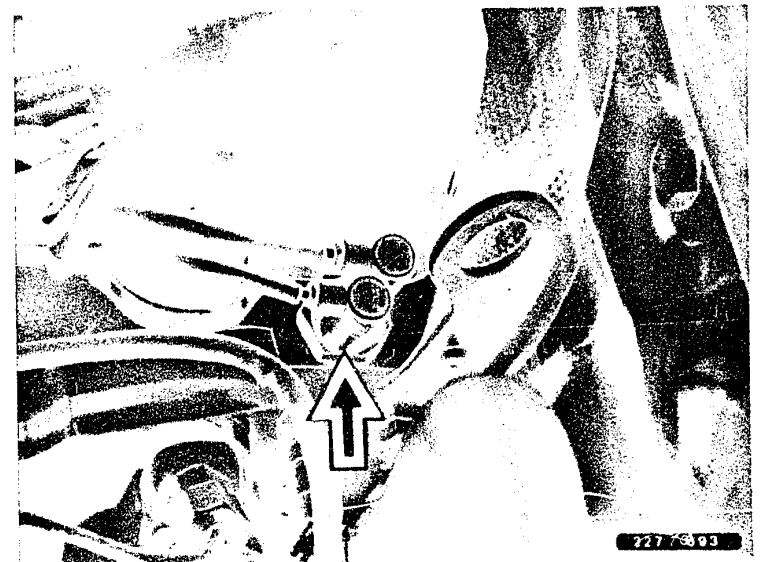
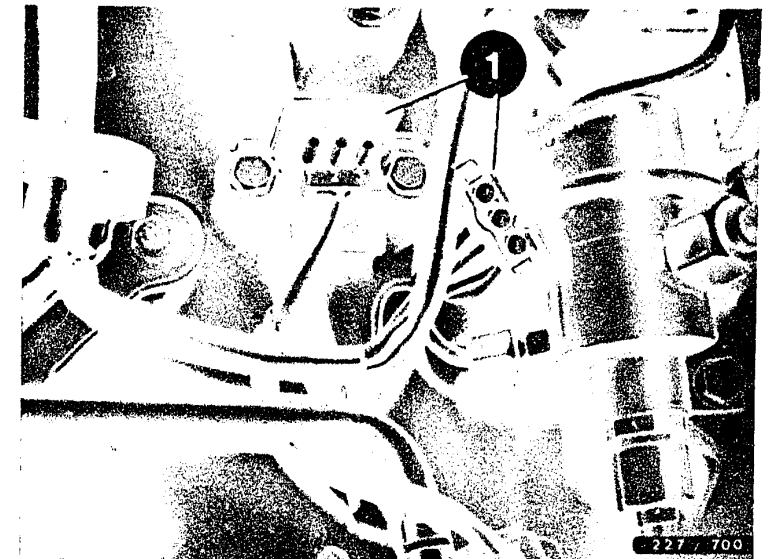
Continued on L19/L20

no

Switch the ignition off.  
Disconnect the electronic ignition control plug and connect an ohmmeter to Term. 1 (see figure at bottom) and vehicle ground.  
For resistances, see the table.

Coolant temperature		Resistance
+ 20°C	=	2.1...2.9 kΩ
+ 30°C	=	1.4...2.0 kΩ
+ 80°C	=	280...370 Ω
+ 90°C	=	210...280 Ω
+100°C	=	160...215 Ω

If the ohmmeter reads  $\infty\Omega$ , then check the lead from the coolant temperature sensor plug (color of cable green/black) to the electronic ignition control unit plug Term. 1 for continuity. Eliminate any break. If the values for resistance deviate, take out and replace the coolant temperature sensor.



L17

Trouble-shooting program  
Mercedes Benz



L18

Trouble-shooting program  
Mercedes Benz



Yes

Check trimming plug.

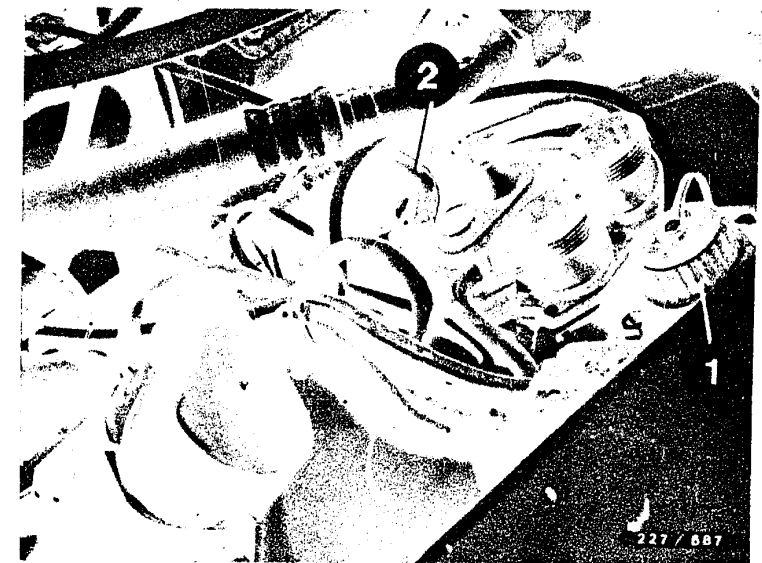
Engine at normal operating temperature.  
Connect motortester to diagnostic socket  
with adapter lead. See top picture.

Disconnect vacuum hose from electronic-ignition control unit.  
See top picture.

Disconnect plug connector from throttle-valve switch.  
See bottom picture.

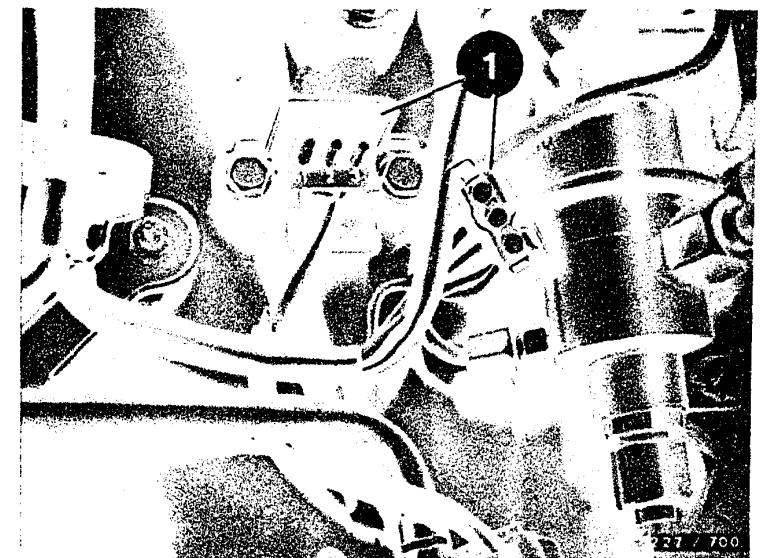
Yes

Continued on L21/L22



1 = Diagnostic socket  
2 = Vacuum hose

1 = Throttle-valve switch plug connector



**L19**

Trouble-shooting program

Mercedes Benz



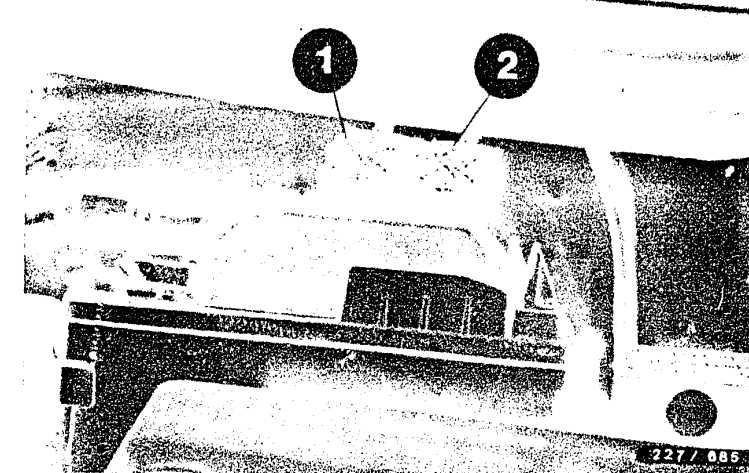
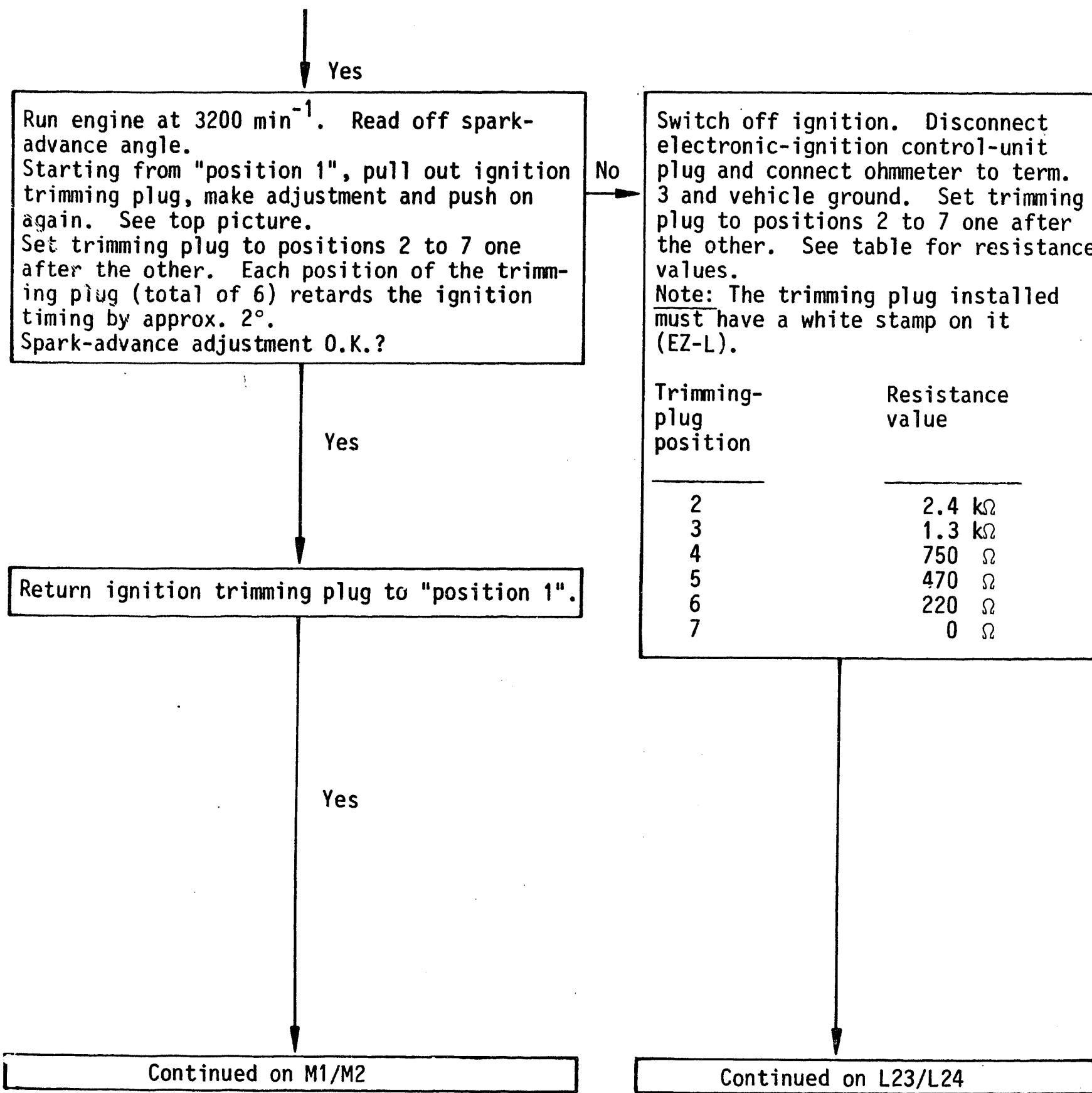
**L20**

Trouble-shooting program

Mercedes Benz

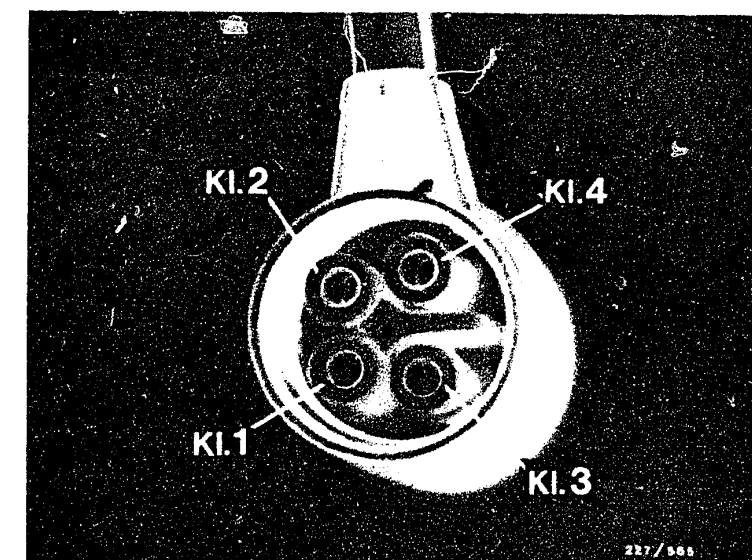






1 = Ignition trimming plug  
2 = Mixture-map trimming plug

Electronic ignition control unit plug



L21

Trouble-shooting program  
Mercedes Benz



L22

Trouble-shooting program  
Mercedes Benz

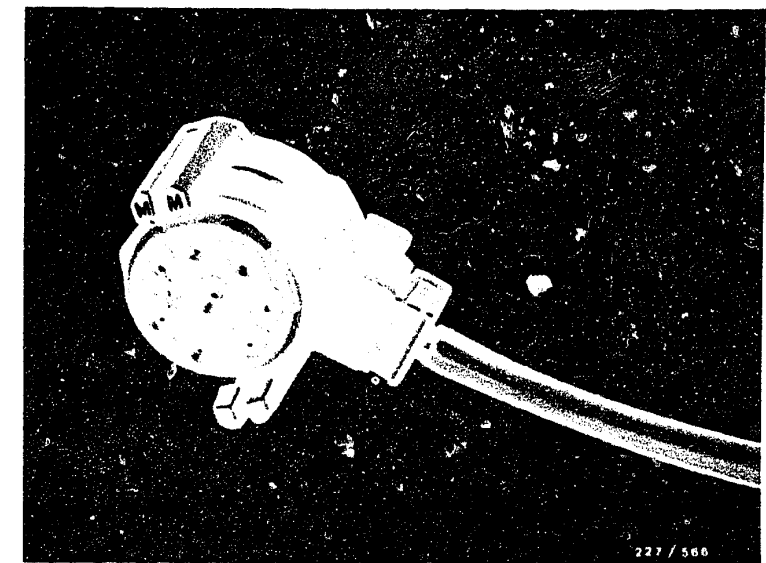


Continued

If resistance was O.K. in all 6 trimming-plug positions, replace electronic-ignition control unit.

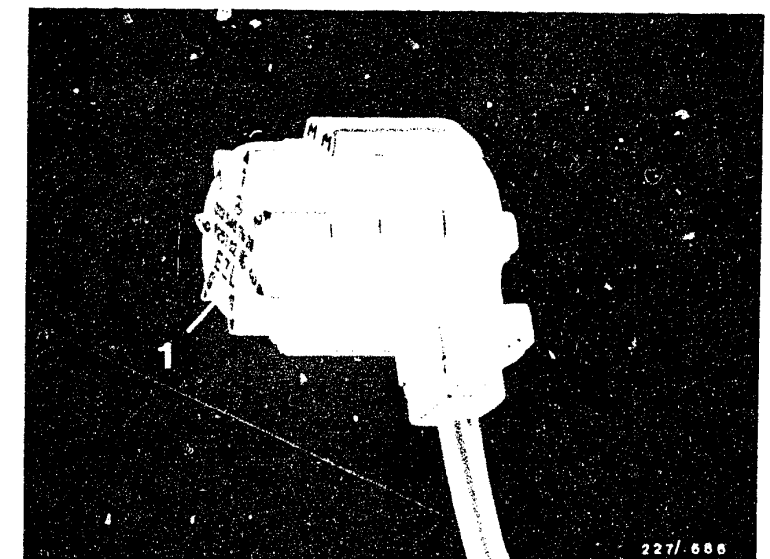
If resistance was approx.  $0\ \Omega$  or  $\infty\ \Omega$  in all 6 trimming-plug positions, replace trimming-plug housing without trimming plug. See top picture.

If resistance was not within tolerance, replace trimming plug. See bottom picture.



Trimming-plug housing

1 = Trimming plug



Yes

Continued on M1/M2

**L23**

Trouble-shooting program

Mercedes Benz



**L24**

Trouble-shooting program

Mercedes Benz



Yes

Check ignition timing.

Engine at normal operating temperature.  
Motortester connected to diagnostic socket  
with adapter lead.

Vacuum hose disconnected from electronic-  
ignition control unit.

See top picture.

Throttle-valve switch plug connector dis-  
connected.

See bottom picture.

Ignition timing should be:

Engine 103.980 23...27° BTDC at 3200  
min<sup>-1</sup>.

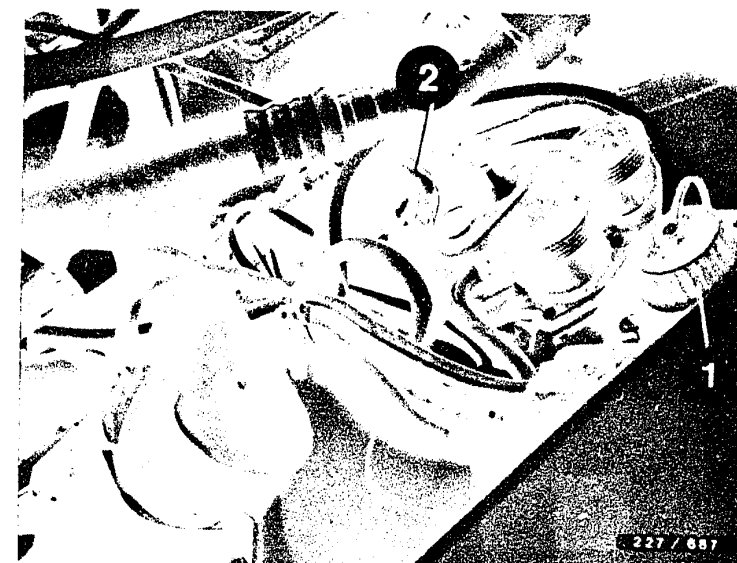
Ignition timing O.K.?

No

Replace electronic-ignition control  
unit.

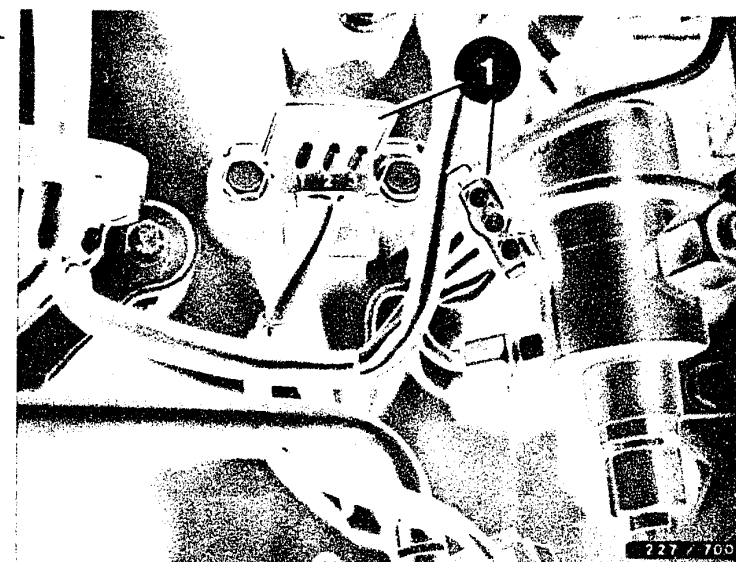
Yes

Continued on M3/M4



1 = Diagnostic socket  
2 = Vacuum hose

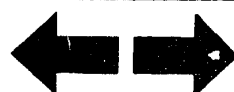
1 = Throttle-valve switch plug  
connector



M1

Trouble-shooting program

Mercedes Benz



M2

Trouble-shooting program

Mercedes Benz



yes

Check throttle-valve switch idle contact.  
Switch off ignition.  
Disconnect KE-Jetronic control-unit-plug. See top picture, arrow.  
Disconnect electronic-ignition control-unit plug and connect ohmmeter to term. 2 and vehicle ground. See top picture, arrow.  
Throttle-valve switch plug connector connected.  
Throttle valve is in idle position.  
Ohmmeter must indicate approx.  $0\ \Omega$  (continuity).  
Open throttle valve.  
Ohmmeter must indicate  $\infty\ \Omega$   
Resistance O.K.?

no

1. Disconnect the plug connection from the throttle valve switch. See bottom picture. Connect an ohmmeter one after the other to:

Throttle valve switch plug connection (wiring-harness end)

Electronic ignition control unit plug

Term. 1 and Term. 2

Term. 2 and vehicle ground

The ohmmeter must read approx.  $0\ \Omega$  (continuity). Eliminate any break.

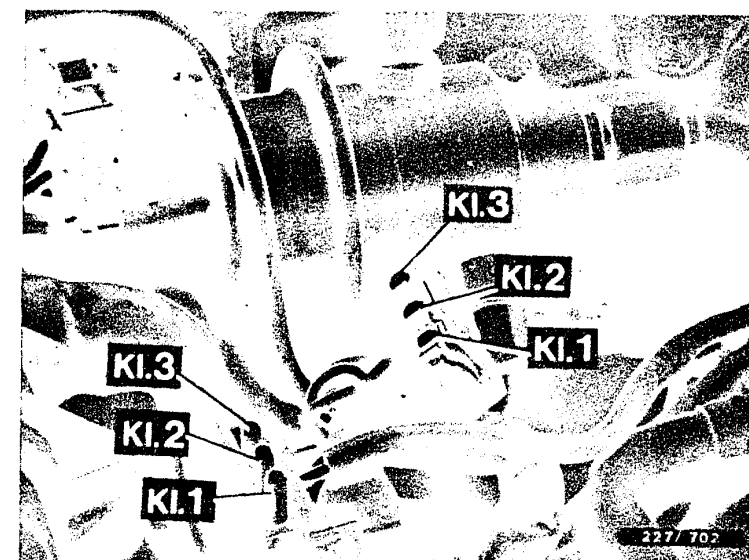
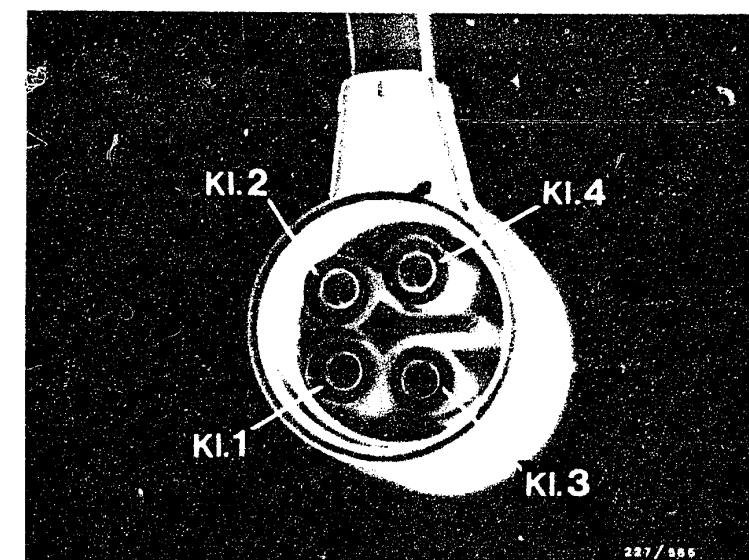
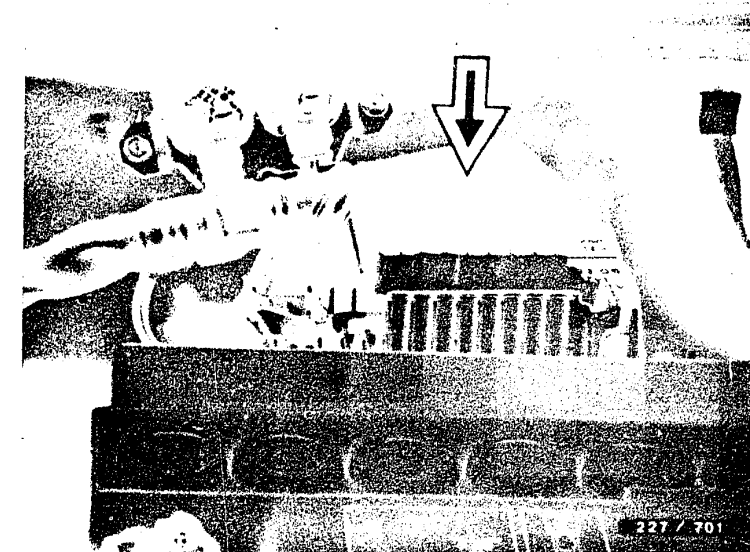
2. Connect the ohmmeter to the throttle valve switch plug connection Term. 1 and Term. 2. See the Figure at the bottom. The throttle valve is closed.  
Resistance approx.  $0\ \Omega$

Open the throttle valve. The ohmmeter must read  $\infty\ \Omega$ .

If resistance not O.K., replace throttle-valve switch.

yes

Continued on M5/M6



M3

Trouble-shooting program  
Mercedes Benz



M4

Trouble-shooting program  
Mercedes Benz



yes

Check the voltage supply to the electronic ignition control unit and the ignition coil.

Connect the voltmeter and test prod to the diagnosis socket Term. 5 (+) and the battery terminal (-). See the Figure.

Run the engine at idle.

The voltage measured must be 12 ... 14 V and must not be more than 1 V less than battery voltage.

Is the value for voltage O.K.?

no

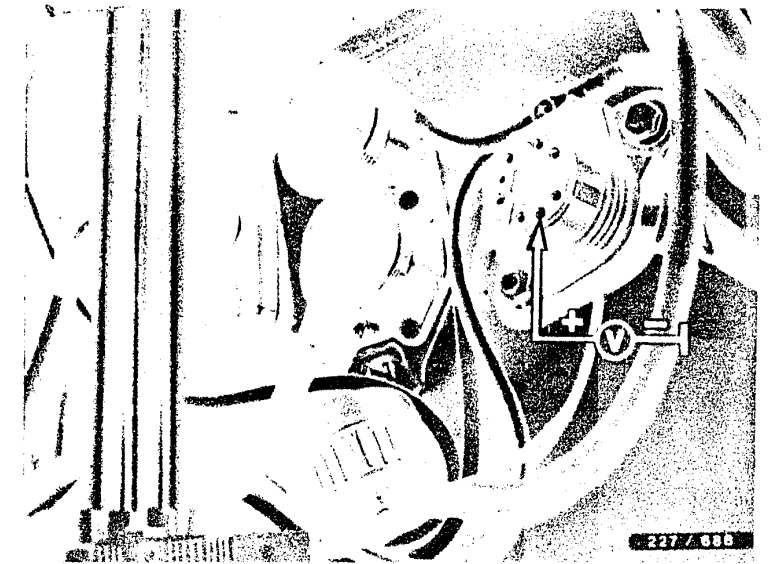
Disconnect the positive lead from the battery. Switch the ignition on. Check the leads from the positive battery terminal to the ignition coil Term. 15 for contact resistance.

Max. contact resistance 0.3  $\Omega$ .  
(Take the resistance of the test lead and the test prods into consideration.)

Eliminate any contact resistance.

yes

Continued on M7/M8



Diagnosis socket

**M5**

Trouble-shooting program  
Mercedes Benz



**M6**

Trouble-shooting program  
Mercedes Benz



yes

Check peak-coil-current cut-off.

Connect voltmeter with test prods to diagnostic socket term. 5 (+) and term. 4 (-).

See picture.

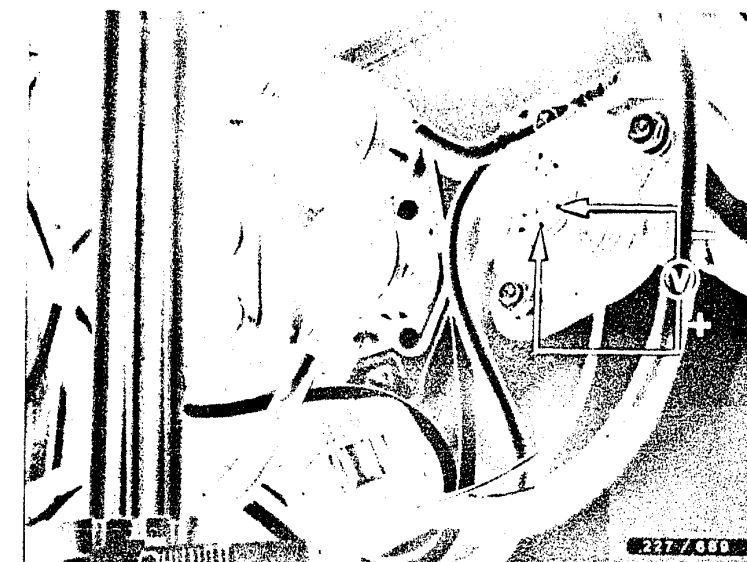
Switch the ignition on. For approx. 1 sec. the voltmeter can move a short distance.

The voltmeter must return to 0 V.

Is the value for voltage (0 V) O.K.?

no

Take out and replace the electronic ignition control unit and the ignition coil.



Diagnosis socket

yes

Continued on M9/M10

**M7**

Trouble-shooting program  
Mercedes Benz



**M8**

Trouble-shooting program  
Mercedes Benz



yes

Test primary voltage.  
(If MOT series available).  
Connect oscilloscope (e.g. MOT 201) together  
with pulse shaper 1 684 463 154 to ignition  
coil according to operatin instructions.  
Note: Incorrect reading without pulse shaper.  
Allow engine to idle.  
Measured primary voltage must be 280-360 V.  
See graph.

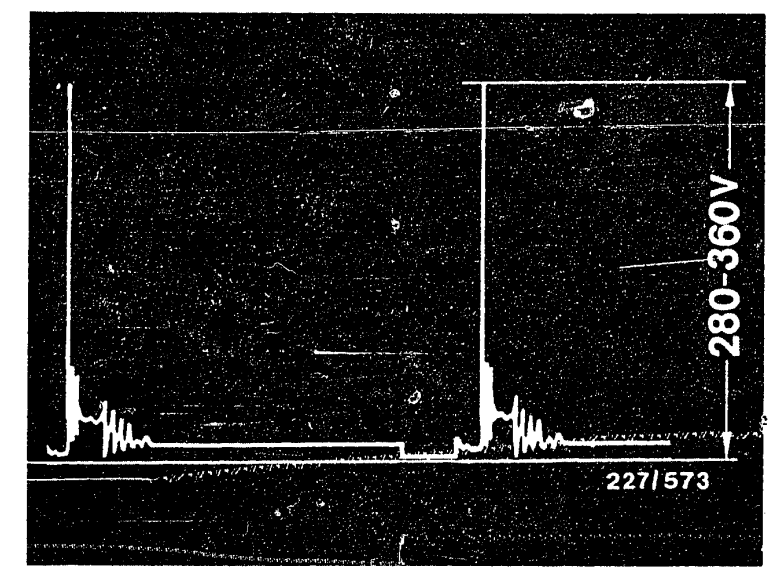
Voltage correct?

no Take out and replace the electronic  
ignition control unit.

yes

Ignition system O.K.  
Test completed  
Tests starting at M11 no longer  
necessary.

Note:  
If customer complaint is not yet remedied,  
then check for further possible faults in  
the fuel system, or engine not mechanically  
O.K.



No primary voltage or no ignition spark.

(Continued from L9/L10)

yes

Check insulation of pulse generator.

Disconnect the electronic ignition control unit plug and connect an ohmmeter to Term. 7 and the battery terminal (-). See the Figure at the top. The ohmmeter must read  $\infty \Omega$ . Is the value for resistance O.K.?

no

If the value for resistance is approx.  $0 \Omega$ , take out and replace the pulse generator. See the Figure at the bottom.

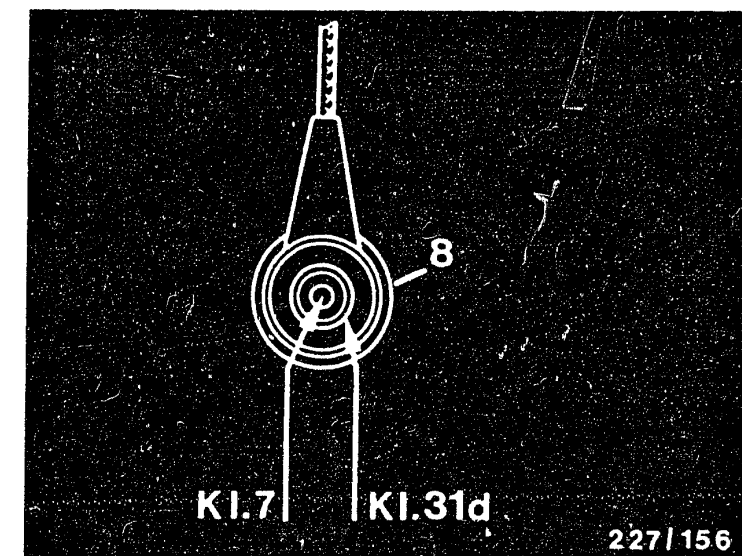
yes

Check the internal resistance of the pulse generator.

Disconnect the electronic ignition control unit plug and connect an ohmmeter to Term. 7 and Term. 31d. See the Figure at the top. The ohmmeter must read 680 ... 1200  $\Omega$ . Is the value for resistance O.K.?

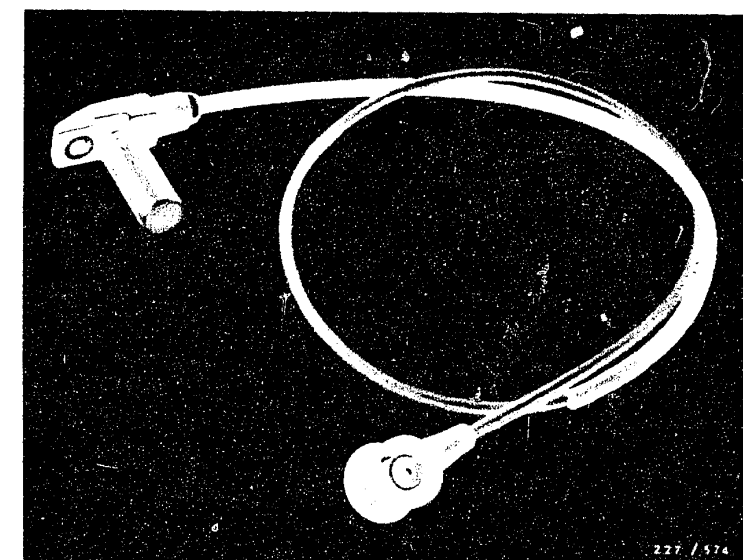
yes

Continued on M13/M14



8=Electronic ignition control unit plug - pulse generator

Pulse generator



**M11**

Trouble-shooting program

Mercedes Benz



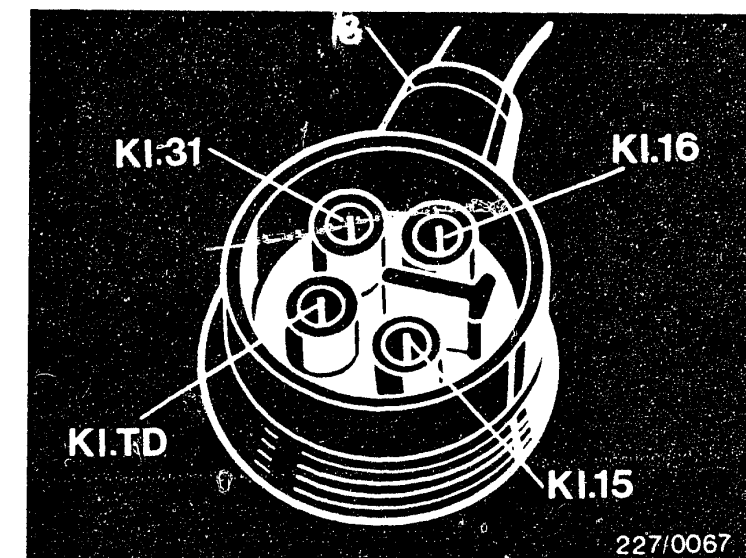
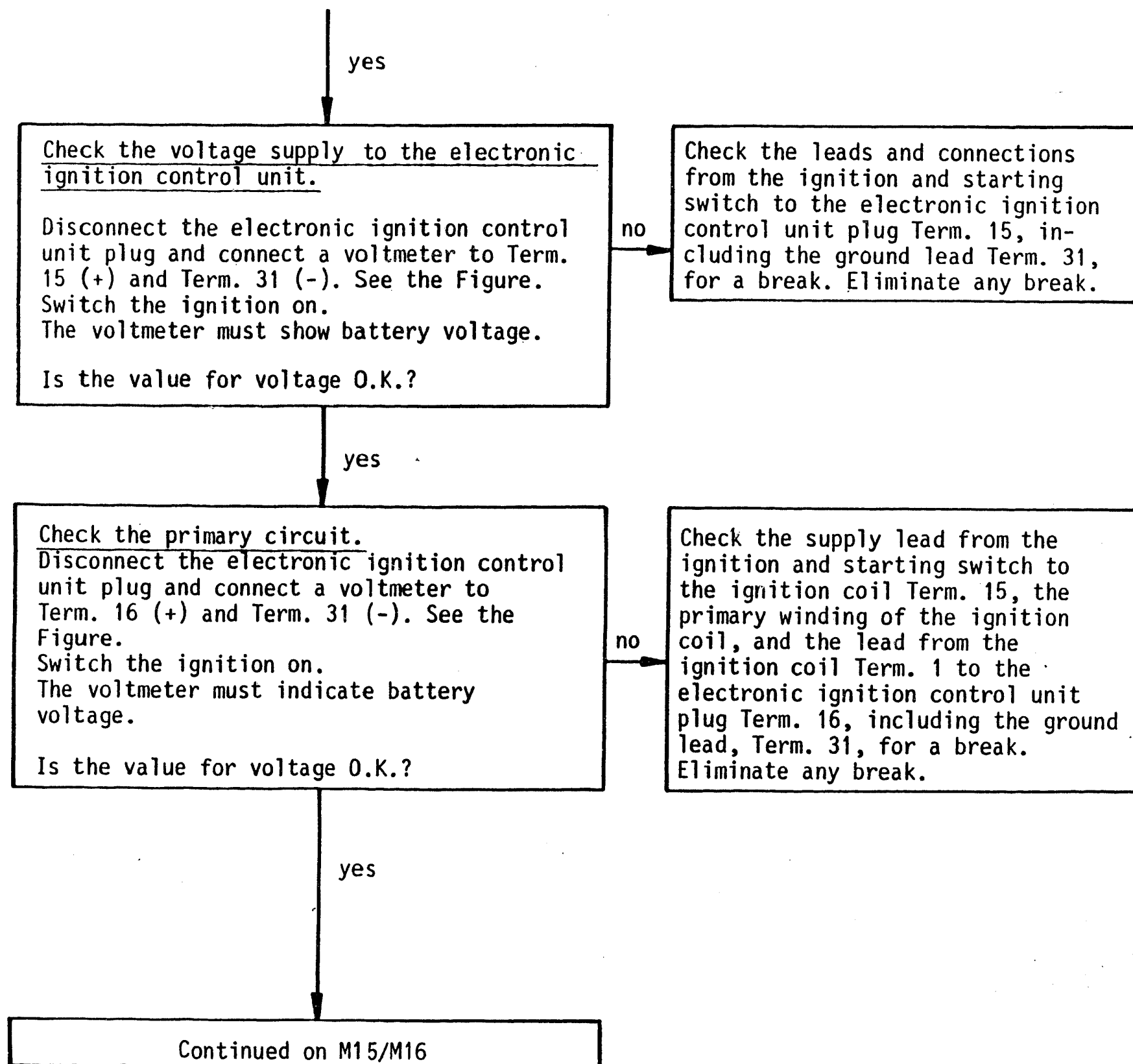
**M12**

Trouble-shooting program

Mercedes Benz

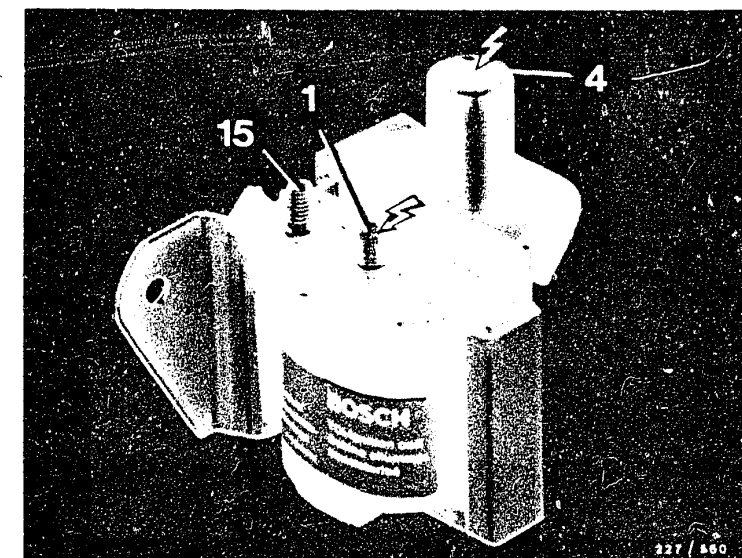
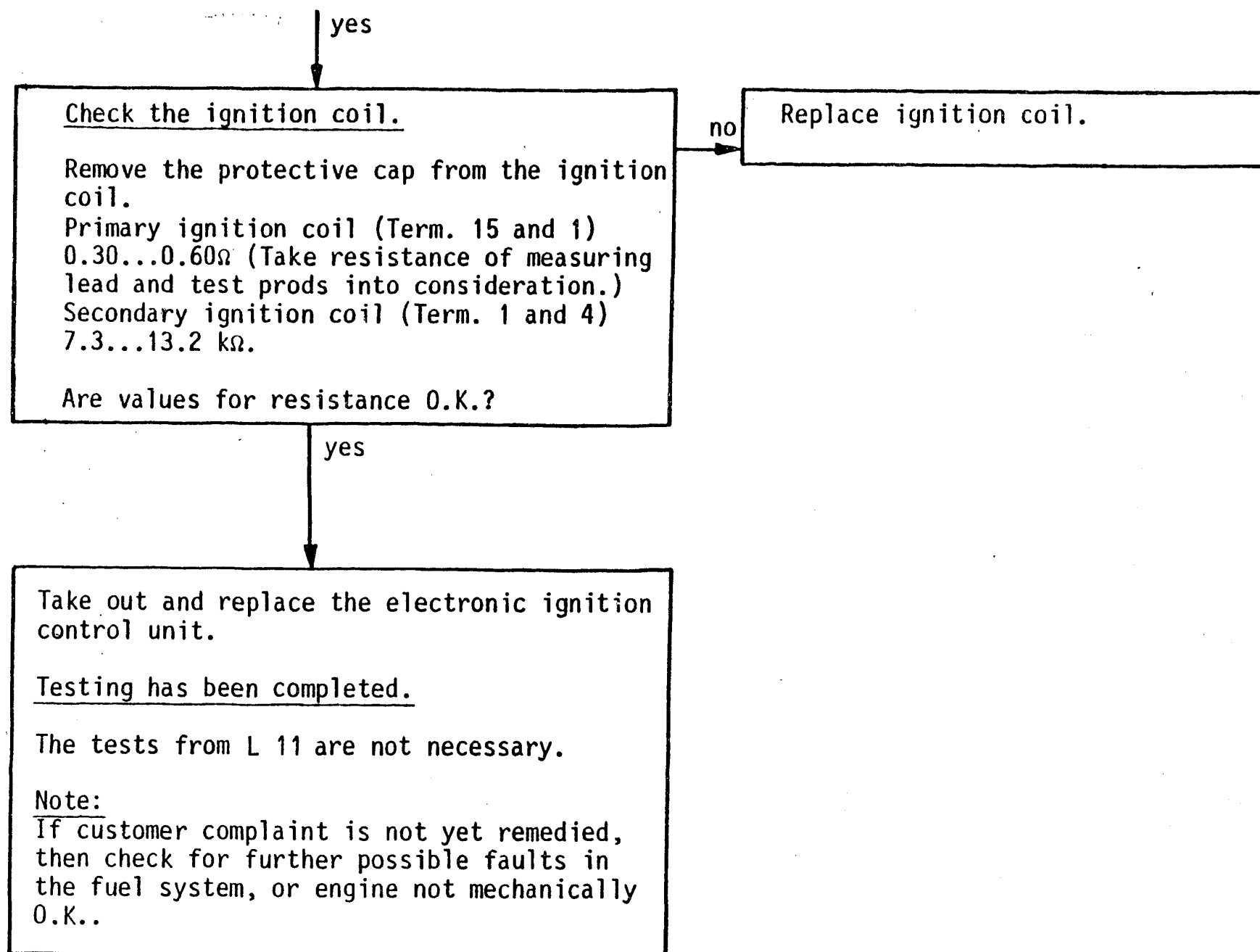






8=Electronic ignition control unit plug





High voltage arrows:  
 Warning, 400 V ... 25 kV!

**M15**

Trouble-shooting program  
 Mercedes Benz



**M16**

Trouble-shooting program  
 Mercedes Benz



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

22

### Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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**N1**

Technical Bulletin

Mercedes Benz

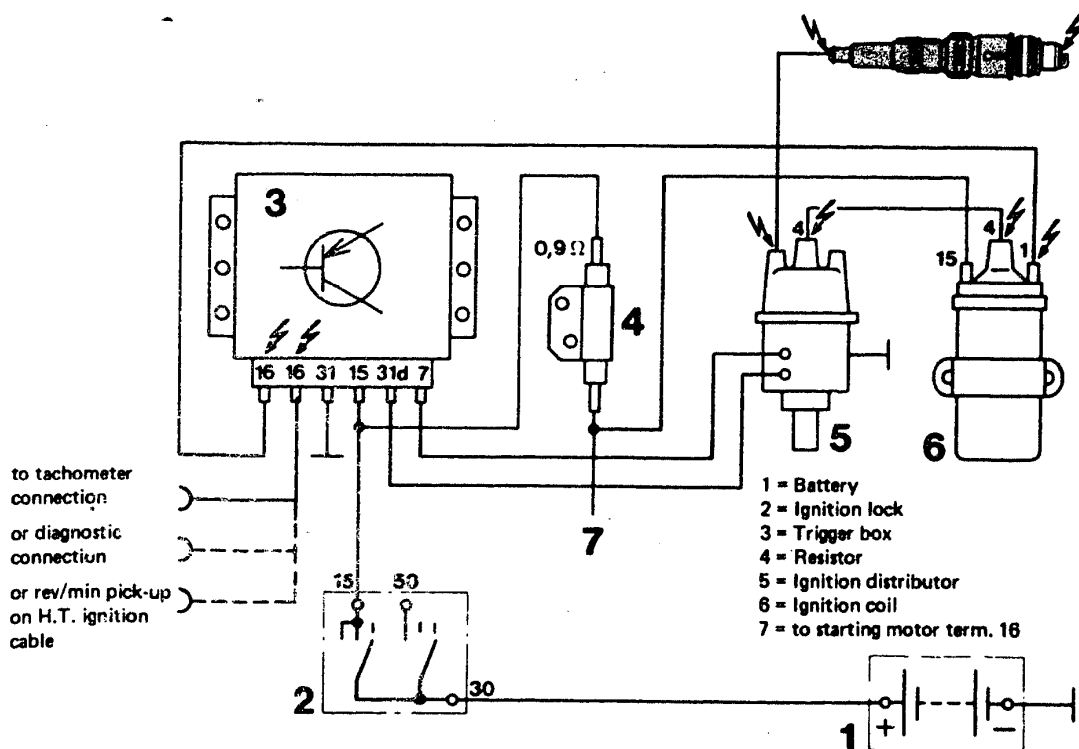


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

EFFECTS OF ELECTRICAL AND ELECTRONIC  
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En

1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).  
Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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**N3**

Technical Bulletin

Mercedes Benz



We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.



# After-sales Service

## Technical Bulletin

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NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-----	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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**N5**

Technical Bulletin

Mercedes Benz



Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributorless ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

\*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).





# After-sales Service

## Motor Vehicle Service Information

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INCORRECT DISPLAY OF ROTATIONAL SPEED AND  
DWELL ANGLE ONLY WITH TRIGGER BOXES  
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT  
LIMITATION

VDT-I-Gen. 030 En  
6.80  
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00}	Rotational-speed	KTE 001.00
001.01}	display O.K. with these	001.02
001.02	testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild- ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General- Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

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**N7**

Motor Vehicle Service Information

Mercedes Benz



## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm

or

1 ballast resistor 1.0 Ohm

2 blade receptacles e.g.

approx. 0.2 m cable, 1.5 mm<sup>2</sup> e.g.

2 insulated clips

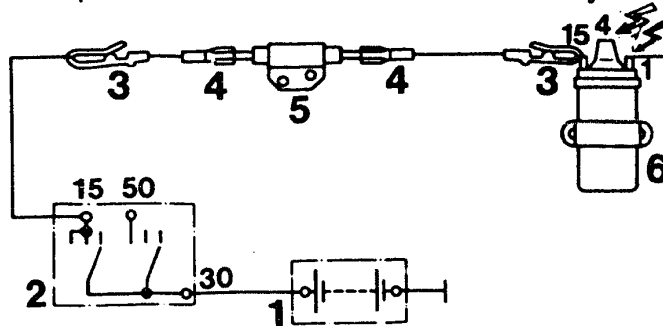
Part No. 0 227 900 002

Part No. 0 227 900 101

Part No. 1 901 355 881

Part No. 6 210 150 150

Commercially available



1 = Battery

2 = Ignition switch

3 = Clips

4 = Blade receptacle

5 = Ballast resistor

6 = Ignition coil

⚡ approx. 400 V

⚡ approx. 25 kV

### 2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

### 2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

### MOTORTESTER CONVERSION

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes  
0 227 100 ... (TCI-i, TCI-h) with current  
limitation

VDT-I-Gen. 032 En  
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268  
268 S 10  
269  
214 B  
AE 2000

### 1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

### 2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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**N9**

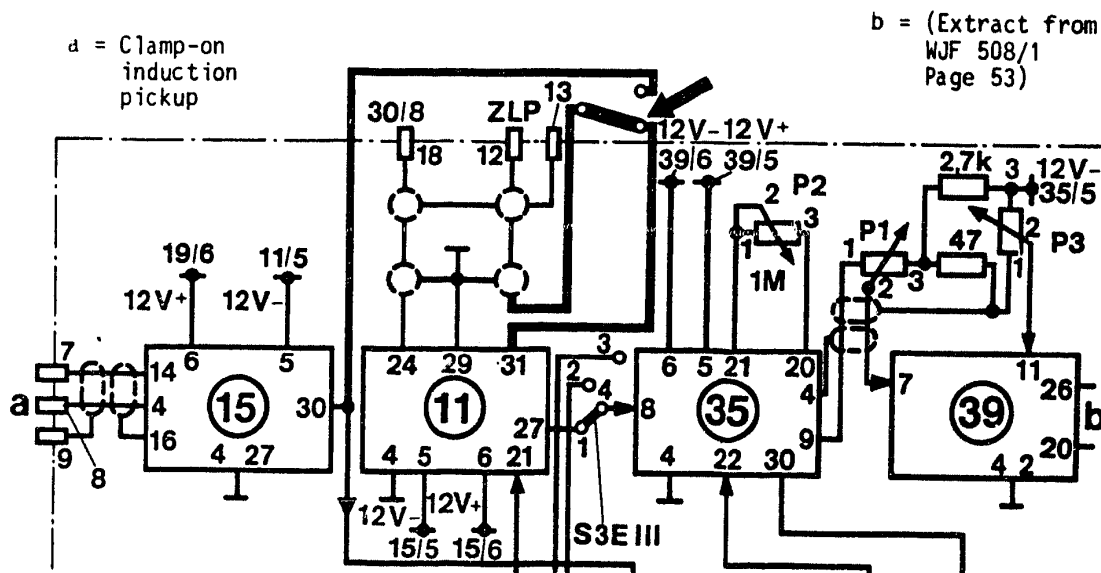
Motor Vehicle Service Information

Mercedes Benz



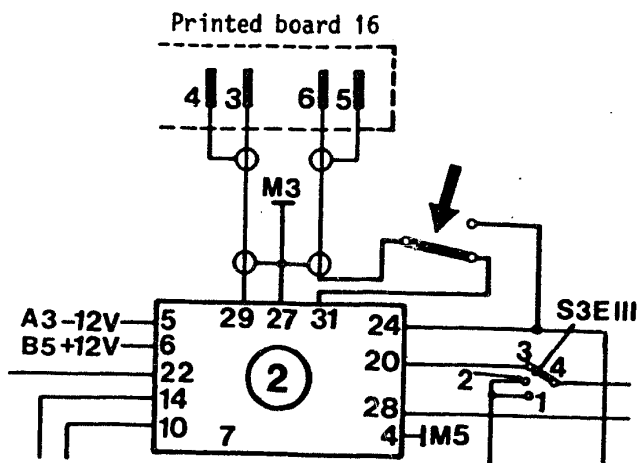
Remove the line of the ZLP\* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

\* ZLP = timing light



## EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation". These conversion measures have already been published in the K7 information sheet KJF 28/7911.



#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

TESTS ON ELECTRONIC IGNITION SYSTEMS

VDT-I-Gen. 035 En

(TCI, TZ)

3.1981

TESTER INSTRUCTIONS

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscilloscope:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

**BOSCH**

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**N12**

Motor Vehicle Service Information

Mercedes Benz



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